COMMUNITY BASED SOLID WASTE MANAGEMENT: THE ASIAN EXPERIENCE

EDITED BY

A .H. MD. MAQSOOD SINHA

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COMMUNITY BASED SOLID WASTE MANAGEMENT: THE ASIAN EXPERIENCE

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Papers and Proceedings of the Regional Seminar on Community Based Solid Waste Management
19-20 February, 2000, Dhaka, Bangladesh

Editors

A.H.Md.Maqsood Sinha

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FOREWORD

Urbanization will be a growing concern of the countries of South Asia, where the world's most dramatic population shifts from rural to urban areas will occur over the next twenty-five years. It is already evident to any resident of the region's cities that solid waste collection and disposal is one of the cities' most pressing problems. It must be ranked as one of the highest priority concerns of any elected official.

While it is a daunting problem, there is much encouragement from the numerous successful and innovative approaches being taken around the region to manage the problem. One of the most heartening aspects of the success stories is that they are based on citizens' own initiatives. "Community-based solid waste management" holds great promise to lead the way to cleaner, healthier cities in South Asia.

The USAID Regional Urban Development Office (RUDO,South Asia) was pleased to be able to sponsor the Regional Seminar on Community Based Solid Waste Management in Dhaka, Bangladesh on February 19-20, 2000. Our partner in the seminar, the Dhaka NGO, Waste Concern, performed an excellent job in organizing the seminar and identifying like-minded NGOs and community groups that presented innovative approaches to solid waste management throughout Asia. It was striking to find that so many of the community approaches were converging to the same approaches: separation, recycling and composting.

RUDO,South Asia would again like to congratulate Waste Concern for its dedication and successes, and we hope that you will find these proceedings helpful to your own search for approaches to the urban environmental management issues of South Asia.

James I. Stein
Director
Regional Urban Development Office (RUDO) South Asia, USAID

PREFACE

Urban solid waste management is considered as one of the most immediate and serious environmental problems confronting municipal authorities in developing Asian countries. Although municipal authorities acknowledge the importance of adequate solid waste collection and disposal as well as resource recovery and recycling, it is mostly beyond their resources to deal effectively with the growing amount of solid waste generated by the expanding cities. Consequently, solid waste is indiscriminately dumped on roads and into open drains, thus leading to serious health risks and degradation of living environment for millions of urban people. In the last decade, however, importance of community involvement in solid waste management and use of adapted technologies were duly recognized for improving the solid waste management system.

In this backdrop, several community-based initiatives have taken place in different Asian cities by the stakeholders, i.e. private sector, community groups, CBOs, NGOs and municipal authorities.

Against this background, a two-day regional seminar on community based solid waste management was organized by Waste Concern in Dhaka, from February 19-20, 2000 with the aim of sharing lessons learned so far from community based solid waste management with stakeholders with a view to evolve a workable strategy for solid waste management as well as for scaling up the activities to supplement the municipal authorities' efforts with community based solid waste management initiatives.

This publication is a compilation of papers presented by the participants in the seminar from different Asian cities and also recommendations made by them during the seminar. The papers presented by them demonstrate that community based solid waste management is a realistic approach to solve the solid waste disposal problem at local level. Moreover, municipal authorities in some Asian

cities are showing interest in these initiatives by supporting communities or private sector to manage part of solid waste management services at local level. It is hoped that in more and more cities and towns, the concerned institutions and organizations would be inclined to promote community based solid waste management approach and integrate with main stream solid waste management system for eventual improvement of the environment.

We are hopeful that in the near future city governments of the region would facilitate institutionalizing innovative community based solid waste management programs into their routine operations by framing suitable strategies and modifying necessary by-laws in this regard.

November, 2000

A.H.Md. Maqsood Sinha

Iftekhar Enayetullah

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PART I

THE SEMINAR AND RECOMMENDATIONS

INTRODUCTION*

BACKGROUND

WASTE CONCERN organized a two-day regional seminar on Community Based Solid Waste Management during February 19-20, 2000 at BRAC CENTRE, 75 Mohakhali Commercial Area, Dhaka. The seminar was sponsored jointly by Regional Urban Development Office (RUDO), South Asia, USAID; Urban Management Program (UNDP/UNCHS), Regional Office for Asia and Pacific and Water and Sanitation Program, South Asia. In addition to inaugural and valedictory session, the seminar was divided into four technical sessions where fifteen papers were presented and critically discussed. On Day-1 two technical sessions were held, the first session was on "Community Participation in Solid Waste Management and Prospects of Community Based Waste Recycling and Resource Recovery", the second one on "Public-Private/GO-NGO Partnership for Solid Waste Management". Two technical sessions were held on Day-2, the first one on "Regional Issues on Community Based Solid Waste Management and Response from Governments" and second one on "Way Forward/ Strategies to Improve and Scale up Community Based Waste Management in the Region". The technical sessions were chaired by Dr. A. T. M. Nurul Amin, Professor, Urban Environmental Management, AIT, Bangkok, Thailand; Mr. Han Heijnen, Environmental Health Advisor, WHO; and Mr. James I. Stein, Director, RUDO South Asia, USAID.

About 100 local and international participants representing government agencies, municipal authorities, international agencies, NGOs, civil society and private sector participated in the seminar.

The seminar was inaugurated by H. N. Ashequr Rahman, Honorable State Minister for Environment and Forest, Government of Bangladesh, while Syed Marghub Murshed, Secretary of the same ministry presided over the session. The session was also addressed by A. H. Md. Maqsood Sinha, General Secretary, Waste Concern,

* Prepared by Iftekhar Enayetullah and A. H. Md. Maqsood Sinha, Seminar Coordinators.

Bangladesh and James I. Stein, Director, RUDO, South Asia, USAID. Professor A. T. M. Nurul Amin presented the keynote paper.

THE INAUGURAL SESSION

While inaugurating the seminar, the Honorable State Minister, H. N. Ashequr Rahman addressed that the present government was eager to acknowledge the solid waste management problem in a positive way and notified that a Special Committee had already been designed to recommend proper solution to the solid waste management problem in the capital. Regarding the waste management problem of the capital city and other city corporations, he said that the Ministry of Environment and Forest was considering the issue earnestly.

Special guest, Syed Marghub Murshed, Secretary, Ministry of Environment and Forest, Government of Bangladesh stated that it has become a normal practice of the city dwellers to dump their waste in the public places which not only obstructs the passers-by but also is very hazardous for health. He urged them to change this attitude to dumping of solid waste. He advised them to discharge their rubbish into nearby waste bin provided by the city corporation all the time. Mr. Murshed mentioned that though it was difficult to find land for disposing waste, the government has taken up steps in order to facilitate a well-managed rubbish system.

A. H. Md. Maqsood Sinha, General Secretary, Waste Concern, claimed that fast growth of urban population had not been matched by an equal rate of infrastructure development and public services and facilities. Therefore, it was a crucial time to acknowledge the waste management problems faced by the authorities. Mr. Sinha added that solid waste management problems should be solved through a participatory system consisting of representatives of public, private sectors as well as NGOs and international development agencies.

TECHNICAL SESSIONS

Fifteen summary papers/case studies from countries as varied as Indonesia and Pakistan, and cities as far as Metro Manila and Dhaka were presented in three technical sessions. The key issues highlighted in the papers are summarized below:

Dr A. T. M. Nurul Amin, Professor, Urban Environmental Management, Asian Institute of Technology, Bangkok, Thailand in his key-note paper entitled *Transforming Waste Into Resource As A Basis Of Building New Urban Community: An Overview Of Regional Experiences,* mentioned the following:

Transforming waste into resource is neither a mere idea, nor it is limited to neither Dhaka's *tokais* nor Cairo's *zabbaleens*. After all, the poor, the marginalized and the disadvantaged all over the world have always looked for resource in the wastes of the rich and the affluent. What is new is the extent and magnitude of interests in turning wastes into resource. Thanks to the growing environmental predicament and economic compulsions of the poor. The disconcerting aspect in this otherwise positive trend is the working and living condition of those the urban poor who engage in resource recovery related occupations. In the backdrop of this, the paper poses several questions for a better understanding of the whole process of waste-resource interface and to explore the possibility of building new urban communities based on waste as resource. These questions include: What is the basis of waste's resource attribute? Is it its reusability? Is it poverty? Too many people without any decent work for earning a living? Limited material resources? Human ingenuity? All of this the list can perhaps be expanded offer some explanations but no one factor singularly explains the whole truth of waste's emergence as a resource with vividity. The paper also asks: how real is it that waste is a resource in the sense that land or water is? If the land as a resource has given rise to one of the most pervading human occupation for living-farming could resource-recovery from wastes also become a widespread occupation? If this is already a trend, what are the danger marks and what stands in the way of making it more fruitful? He suggested the need for real change in our (we, the community of waste generators) attitudes towards wastes and recommends institutional measures for infusing respectability and job esteem to resource-recovery related occupations. Potential is seen to exist for building new urban communities based on waste as resource. Essential institutional roles in all this (especially at the small spatial scales neighborhood, worksite, dumpsite of local environmental management) are for helping to forge partnership between the community of waste-generators and the resource-recoverers.

Mr. Anslem Rosario of Waste Wise, Bangalore, India, in his paper entitled *Community Based Decentralized Solid Waste Management Systems Forging New Partnership*, mentioned multi-stakeholder participation in solid waste management. Community based initiatives work because they offer local solutions in addressing

local problems. They are adaptive and flexible to suit local conditions. The public sector, on the other hand, works on a 'wholesale' basis. They traditionally view SWM as a "technical" problem, whereas management and social issues are just as important. Here CBOs have a comparative advantage over the public sector.

Mr. Christian Zurbrugg of Swiss Federal Institute of Environmental Science and Technology, Switzerland in his paper entitled *Waste Collectors are Operating a Composting Unit on Neighborhood Level An Indonesian Example*, informed that it was the public sector that sowed the seed of community based initiatives. It shows that the public sector may also be eager to embrace alternative options in solving SWM problems. He stressed that it is vital for the government to become aware of the cost of saving factor of community based decentralized composting schemes, as transport and volume of waste to be disposed of is significantly reduced. Composting projects should involve and be supported by the responsible government agencies at an early stage, and government support for awareness programs, product subsidies and marketing efforts should be pursued further.

Mr. Iftekhar Enayetullah and Mr. A. H. Md. Maqsood Sinha of Waste Concern, Bangladesh in their joint paper entitled *Community Based Solid Waste Management: Experience of Waste Concern in Dhaka* observed the following:

- Land is essential for composting. This presents a special challenge as land is at a premium in most cities.
- Motivation is very important. Without strong motivational components, community based initiatives are not expected to work.
- Provided land is free or the rent is nominal, community based decentralized composting integrated with door-to-door solid waste collection is viable and financially self-sustainable.

Dr. Tanveer Ahsan and Mr. Shafiul Azam Ahmed of Water Sanitation Program – South Asia, Bangladesh in their joint paper on *Problems and Prospects of Solid Waste Management in Khulna* highlighted the following:

- Community based solid waste management does work.
- Without strong motivational components, community based initiatives are not expected to work.
- Financial assistance may be needed for nascent community based or micro-enterprise initiatives before they mature into self-sustaining institutions.

Mr. M. B. Nirmal of Exnora, India in his paper entitled *Stimulating Community Participation in Solid Waste Management: Experience of Exnora International* addresses how rural issues became responsible for overcrowding of the cities and the consequent breakdown of sanitation in cities. Exnora understood that we waste natural resources by misusing them and we waste human resources by not using them. Therefore, using our human resources can certainly save a lot of natural resources.

H. M. U. Chularathna and R. M. R. Ratnayake of Sevanatha, Sri Lanka in their joint paper entitled *Use of Compost Bin as an Alternative Solution to Household Solid Waste Problem in Urban Areas* pointed out that motivation is an essential element for success in community based projects. Apart from motivation, support from national level as well as municipal authority is also essential for replication of innovative projects.

Mr. R. P. Sisodia, Additional Commissioner, Municipal Corporation of Hyderabad, India in his paper entitled *Innovations in Community Based Solid Waste Management Initiatives Hyderabad Experiment,* presented salient features of the unit system of privatization implemented in Hyderabad. Mr. Sisodia also cited examples of community supervision to ensure effective service delivery in Hyderabad.

Ms. Bebet G. Gozun, of Recycling Movement of Philippines in her paper entitled *Empowering Communities for Solid Waste Management: Strategies and Practices* raised the following issues based on Philippines' experience:

Community based solid waste management plays a significant role in service delivery and can have following benefits

- Removes waste/cleans up area.
- Provides opportunities for employment and livelihood (poverty alleviation measure).
- Augments household and community income.
- Creates strong sense of community spirit.
- Service delivered at lower cost to community and government. Local Government Unit savings can be used to other social and infrastructure needs.

Mr. Tariq Bin Yousuf, Executive Engineer, Dhaka City Corporation (DCC) in his paper entitled *Community Based Waste Management: Possibilities of Partnership*

informed about Dhaka City Corporation's plans to encourage private sector/NGO in solid waste management. Mr. Yousuf mentioned modification of municipal ordinance is needed to accommodate inclusion of NGOs/CBOs and Micro-enterprises into the mainstream of solid waste management.

Ms. Saima Shinwari of Human Resources Management and Development Center, Peshawar, Pakistan in her presentation mentioned the case study on their solid waste management project at Peshawar. In her presentations she raised the following issues:

- Necessity of research on low-cost composting in Pakistan.
- There is a need to study how two operations of composting and primary collection could be transformed into micro-enterprise.
- Existence of double taxation in the areas where CBOs are working, as residents have to pay door-to-door collection fee as well as conservancy tax to the municipalities.

Md. Ghulam Murtaza and Dr. Md. Abdur Rahman of Khulna University, Bangladesh in their joint paper entitled *Solid Waste Management in Khulna City and a Case Study of a CBO: Amader Paribartan* informed the seminar that Khulna City Corporation's present infrastructure, in terms of manpower, resources and disposal network, in the face of growing demand for increasing solid waste management is inadequate and therefore needs strong support from both the Government and donors. In recent years, a number of NGOs and CBOs have taken supplementary initiatives in solid waste management in 10 out of 31 wards in KCC area. A case study of *Amader Paribartan*, a CBO, has generated a lot of interest among the dwellers in ward no. 24 of the city, but it has many limitations, too. In order to make the role of CBOs more effective it deserves financial, technical and institutional support from other sources. The major overall problems relating to solid waste management in KCC have been outlined. Immediate, medium and long-term action plans have been recommended to augment the solid waste management scenario in the city to enable it to meet the ever-increasing demand of solid waste management.

Mr. Mewa Lal of Muskan Jyoti Samiti, Lucknow, India in his paper informed that since 1994 Muskan Jyoti Samiti has been working in Lucknow. Their operations include street sweeping, garbage collection, sorting, transportation, disposal and vermi-composting. It recovers the operation and maintenance cost from the

households served and composting activity. The project in Lucknow is financially self-sustainable.

Mr. Anjum Parvez Qureshi, Waste Busters, Karachi, Pakistan in his presentation highlighted some of the activities undertaken by them, which are

- Garbage disposal control zones
- Distribution of garbage disposal bags
- Collection of garbage bags
- Transfer of garbage to recycling facilities

Ms. Almitra H. Patel, Convener, INTACH Waste Network, India, in her presentation discussed the recent Draft Municipal Solid Waste (Management and Handling) Rules, 1999 issued by the Ministry of Environment and Forest, Government of India.

Mr. P. U. Asnani of USAEP/USAID, in his paper entitled *Modernization of Solid Waste Management Practices in India with NGO, Public and Private Sector Participation,* informed the seminar about the recommendations made by the Indian Supreme Court Committee on Solid Waste Management for improvement of the situation in India. He suggested for adoption of the recommendations in other regional countries.

Key Issues Raised in the Papers Presented on Day One

1. Phenomenal Growth in Urban Population is Creating Solid Waste Disposal Problem

A major change is happening in the world before our eyes. For the first time in history more people would be living in cities than in idyllic villages. Many cities in the South are already bursting at the rim, yet they keep on growing as more people gravitate towards urban centers in search of opportunities.

One of the first visible victims of this massive upsurge in urban population is mounting garbage generation that remains uncollected. Solid waste management traditionally belonged to the realm of the public sector, but it can now hardly cope with collecting and disposing ever-increasing amount of garbage.

2. *Alternative Service Delivery is Required*

The presenters provided two rays of light in dispelling the dismal darkness surrounding the solid waste management scene. These are:

a) community participation;
b) public-private partnership.

Mr. Rosario's paper on India described multi-stakeholder participation. Community based initiatives work because they offer local solutions in addressing local problems. They are adaptive and flexible to suit local conditions. The public sector, on the other hand, works on a 'wholesale' basis. They traditionally view SWM as a "technical" problem, whereas management and social issues are equally important. Here CBOs have a comparative advantage over the public sector. This has been echoed by many authors.

It was encouraging to know from Mr. Zurburgg's presentation on Indonesia where it was the public sector that sowed the seed of community based initiatives. It shows that the public sector may also be eager to embrace alternative options in solving SWM problems.

3. *Community Based Initiatives Do Work*

Mr. Iftekhar Enayetullah and Mr. Maqsood Sinha's joint paper on Dhaka, Mr. Chularatna and Mr. Ratnayake's joint paper on Colombo and Dr. Tanveer Ahsan's paper on Khulna, and indeed other papers also established the fact that community based solid waste management does work. But the authors expressed some caveats:

a. Land, which is essential for composting, presents a special challenge as it is at a premium in most cities.

b. Motivation is very important. Without strong motivational component, community based initiatives are not expected to work.

4. *What is Needed to Nurture Community Based Initiatives?*

Financial assistance may be needed for nascent community based or micro-enterprise initiatives before they mature into self-sustaining institutions. This view was expressed by Ms. Saima Shinwari and Dr.Tanveer Ahsan. Messrs. Maqsood

Sinha and Iftekhar Enayetullah's experience showed that the NGO based initiative introduced a few years back had already reached financial independence.

Mr. Tariq Bin Yousuf mentioned that upgrading municipal ordinances are needed to accommodate inclusion of NGOs, CBOs and Micro-enterprises into the mainstream of solid waste management.

The issue of double taxation came up in Ms. Saima Shinwari's and other papers. In most cities, the citizens pay a conservancy tax for solid waste management services. CBOs charge an additional fee on top of that. Understandably, people are reluctant to pay twice for the same service. It requires communications and motivational skill to convince people that their tax to municipal authorities usually cover secondary collection only. For extra service of door-to-door primary collection, an additional nominal fee has to be borne, if not included in the conservancy tax.

Mr. Sisodia cited examples of community supervision to ensure effective service delivery. This is an exciting idea to build partnership between service-providers and service-receivers. It should increase both accountability of service-providers and ownership of the community members.

5. The Need for Research

Dr. Abdur Rahman mentioned that good, reliable data on solid waste management in our cities are scarce. It is very important that we understand what components exist in our waste stream and how much waste is generated before we can devise appropriate intervention method to tackle the problem.

6. Is Service Delivery by CBOs/NGOs All Good?

Mr. Ghulam Murtaza raised some important issues regarding service delivery by CBOs and NGOs. As we extol the virtues of these organizations, we tend to overlook their own limitations as well. Mr. Murtaza pointed out that many CBOs/NGOs employ children as waste collectors. It is true that in most cases these children are given a chance to attend school and they receive other benefits that greatly improve their standard of living. Nevertheless, the issue of child labor has to be taken seriously by all concerned.

Sometimes the alternative service delivery is not as effective and efficient as it is supposed to be. It has to be borne in mind that people pay extra charge to receive

quality service that is not conventionally available. There is no point in introducing alternative service-providers if they fail to provide quality service.

It has been observed in many places that community based initiatives which sprout spontaneously do not feel the necessity to maintain close linkage with the formal sector. Not having much interaction, the private and the public sector operators work in mutual isolation. Some elements of mistrust are also present between both parties. This gap between the CBOs/NGOs and local authorities works against the principle of partnership, and the entire operation is deprived of synergistic benefit.

7. The Need for Networking

Necessity for networking was mentioned by Dr. Murtaza and many others. A lot of experience and research are available that can benefit all actors in the sector. Exchange of information is presently trickling through events such as this workshop. We heard from Mr. Iftekhar Enayetullah that their community based composting venture was modeled after an Indonesian experience and the barrel type composting initiative for slums was adapted from Sri Lanka. A networking platform would expedite such process of learning and contribute much to our knowledge base. As the network members become better informed, they can even conduct policy advocacy to bring about necessary changes in the policy frameworks.

8. Innovations

There were several fascinating presentations on innovative initiatives. Mr. Qureshi's paper described his effort in containing garbage in bags to limit spillage and scattering in Karachi, Pakistan.

Mr. Mewa Lal presented impressive figures on his operations. His organization has now over 30,000 subscribers. He is already expanding his services to drain cleaning and street sweeping in addition to door-to-door garbage collection. As Dr. Tanveer Ahsan pointed out, successful primary collection of waste by CBOs/NGOs may open up other services to them also.

Mr. Mewa Lal and others also have gained good experience in vermi-culture and dealt with liquid waste. It appears that with these innovative approaches towards waste may truly become a resource.

Messrs. Iftekhar Enayetullah and Maqsood Sinha's joint paper revealed that the project of Waste Concern in Dhaka is self-sustainable and this type of project can be easily located within the community.

Key-Issues Discussed on Day Two

One paper was presented in first session of the day. In the second session group discussions were held.

Mr. P.U. Asnani of USAEP/USAID, in his paper entitled *Modernization of Solid Waste Management Practices in India with NGO, Public and Private Sector Participation,* informed the seminar about the recommendations made by the Indian Supreme Court Committee on Solid Waste Management for improvement of the situation in India. He suggested for adoption of the recommendations in other regional countries. He further informed that the aforesaid Committee has recommended that:

- All food and biodegradable waste should be composted; recyclable waste should be passed on to the recycling industry; and only rejects should be landfilled in a scientific manner.

- Decentralized composting with public and NGOs/CBOs participation should be encouraged wherever possible.

- Caution against using unproven technologies should be observed. Local bodies are advised not to adopt expensive technologies of power generation, fuel pelletization, incineration, etc., until they are proven sound under Indian conditions.

RECOMMENDATIONS

Key-issues and strategies identified for scaling-up of community based solid waste management by the participants during the group discussion session are listed in the following table.

Key-Issues and Strategies Identified for Scaling-up of Community Based Solid Waste Management by the Participants During the Group Discussion Session

ISSUES	STRATEGIES / MEASURES	RESPONSIBILITY
Inadequate Solid Waste Management Policy/ Municipal Act/Ordinance	♦ Enabling policy framework for encouraging and facilitating CBOs/ NGOs/ Private Sector to gradually take over Solid Waste Management services	♦ National Government and Local Government Bodies
	♦ Framing such policies that allow local bodies to entrust Solid Waste Management services to NGOs / CBOs/ Private Sectors	♦ National Government and Local Government Bodies
	♦ Institutionalization of co-ordination mechanism between local bodies and NGOs/CBOs	♦ National Government, Local Government Bodies and NGOs
Lack of adequate fund/ resources for Entrepreneurs/ CBOs / NGOs	♦ National, State and Local Level Bodies should provide administrative, financial and logistical support e.g. land, equipment, mobilization fund to the CBOs/ NGOs/ Private Sector	♦ National Government and Local Government Bodies
	♦ Corporate Sponsorship	♦ Private Sector
	♦ Bank Loan on easy terms	♦ National Banks
	♦ Government incentives on recyclable materials and compost	♦ National Government and Local Government Bodies
	♦ Support in kind by Local Government Bodies	♦ Local Government Bodies
	♦ Seed Money from donors	♦ Donors

ISSUES	STRATEGIES / MEASURES	RESPONSIBILITY
Lack of community awareness and willingness to pay	♦ Creating awareness through proper communication strategy	♦ National Government, Local Government Bodies, NGOs
	♦ Involving local schools and inclusion in education curriculum with respect to solid waste management	♦ National Government, Local Government Bodies, NGOs, Schools
	♦ Organizing workshop with stakeholders about solid waste management issues	♦ Local Government Bodies, NGOs and Donors
	♦ Raising the Problem: Why the issue needs to be discussed through Mass Media	♦ National Government, Local Government Bodies, NGOs
	♦ Making user charge mandatory for house to house solid waste collection, but allowing community to choose service providers.	♦ National Government, Local Government Bodies, Community Groups
	♦ Determining variable rates of user charges depending on income levels of the beneficiaries	♦ National Government, Local Government Bodies, NGOs
Lack of operational capacity of Local Government Bodies, NGOs/CBOs	♦ Preparing an easy to understand user friendly manual on solid waste management, recycling and resource recovery	♦ NGOs and Local Government Bodies
	♦ Preparing guidelines on solid waste management	♦ National Government and Local Government Bodies

ISSUES	STRATEGIES / MEASURES	RESPONSIBILITY
	♦ Imparting proper training for improvement of management skill of Local Government Bodies, NGOs/ CBOs/ Private Sectors	♦ Local Government Bodies, NGOs, International Agencies and Donors
Need for networking and compiling adequate database on solid waste management	♦ Facilitating exchange of information through events like seminar/ workshop / internet conference	♦ NGOs /International Agencies/ Donors
	♦ Establishment of network platform on solid waste management can expedite the process of learning and contribute to knowledge base and help in policy advocacy to bring necessary change in municipal laws	♦ NGOs /International Agencies/ Donors
	♦ Scarcity of adequate and reliable data on solid waste management can be tackled by action research to collect necessary data for cities	♦ Local Government Bodies, NGOs, Research Institutes

VALEDICTORY SESSION

Apart from presentation of aforementioned strategies by three groups on scaling-up of community based solid waste management, the valedictory session was addressed by Mr. James I. Stein, Director, RUDO South Asia, USAID, Mr. Habibullah, Secretary, Dhaka City Corporation and Mr. Iftekhar Enayetullah, Asstt. General Secretary of Waste Concern. The closing remarks were made by Professor Nazrul Islam, Chairman, Dhaka Water and Sewerage Authority (DWASA) Board and Professor of Department of Geography and Environment of University of Dhaka, who presided over the concluding session of the two-day regional seminar.

After the valedictory session of the seminar, Dhaka City Corporation (DCC) authorities organized a site seeing tour for the international participants to visit various landmarks of Dhaka City.

CONCLUSIONS

The objective of the regional seminar on Community Based Solid Waste Management was to share various experiences of community based solid waste management in the Asian region (in particular Bangladesh, India, Pakistan, Sri Lanka, Nepal, Indonesia, and the Philippines). Its real intention was to compare and exchange the innovative approaches being followed in the region and also to discuss present challenges, deficiencies and impacts of community based solid waste management schemes as well as to reach a consensus as to how it can be scaled-up.

The seminar also focused on integration of community based solid waste management schemes with formal municipal solid waste management system for tangible environmental improvement of the regional cities and suggested measures for its scale-up and integration with municipal solid waste management system.

The recommended measures/strategies for scaling-up emerged from a large number of papers presented on Day-1 and group discussions and specific recommendations to certain sub-themes on Day-2.

The seminar recognized that a regional exchange on the present experiences and practices on community based solid waste management has started, and this itself is a very positive development in the region. It was encouraging to note that various experiences of different countries are viewed as mutually reinforcing, as all the regional countries are following the same concept of management of solid waste, i.e., promoting door-to-door collection, source separation, neighborhood composting and advocacy for awareness building.

It is hoped that in more and more cities and towns, the concerned institutions/ organizations would be inclined to promote community based solid waste management approach and integrate with mainstream solid waste management system for eventual improvement and benefit of the environment.

In conclusion, it is expected that in the near future city governments in the region would facilitate institutionalizing innovative community based solid waste management programs into routine operations of the local governments by framing suitable strategies and modifying necessary by-laws in this regard.

PART II

INAUGURAL SESSION: THE ADDRESSES

ADDRESS OF THE CHIEF GUEST

H. N. Ashequr Rahman
Honorable State Minister for
Environment and Forest
Government of the People's Republic of Bangladesh

Mr. Chairman, Distinguished Guests and Experts, Ladies and Gentlemen,

Thanks for the kind invitation at this Regional Seminar on Community Based Solid Waste Management. We are grateful that this seminar, dealing with a vital and very important subject, has been organized by Waste Concern and jointly sponsored by the Regional Urban Development Office (RUDO), South Asia, USAID and UNDP/UNCHS, and Water and Sanitation Program-South Asia.

Environment has not been a major concern until recent decades. Throughout history, people have taken resources from nature, transformed them into products for their use, and then discarded the leftover. The practice, of course, often forced our early ancestors to change their locations as build-up of waste rendered existing settlements uninhabitable. This was possible when the human population was small and vacant places were easy to find. During the last century, we have experienced the explosion in scientific achievement, expansion and unbridled proliferation of industries and factories, improvement in hygiene and medicine, population boom, rising of consumption oriented societies, growth of concentrated human habitation, metropolis and mega cities. Today we have reached the mark of 6 billion in human heads.

It is simply no longer possible to avoid waste that we create in different forms-solid, liquid or gaseous and disposing of them is becoming more and more of a burden.

In Bangladesh, we are experiencing unmitigated urbanization, continuous continuum of the population to the cities, birth of under-class and shanties, and consequent inadequacy and imbalance in waste-disposal management. The specter is more pronounced in the city of Dhaka, which is the proud capital of our independent country.

The capital of a country is not merely a city but a leader among the cities. National activities in its highest form of excellence find expression and habitat in the capital. The capital in its health or sickness, vitality or decadence shall surely permeate through the nation and cast its strength or shadow. It is indeed essential to sustain and nurture the city as the source of continued vitality, functions and discipline. But Dhaka stands as a sorry spectacle.

There are some pre-requisites for a city to live and thrive. These are water supply, sanitation, recreational facilities, waste-disposal, etc. Many a city in the old times was built on the rivers and the rivers dried up or changed the course, the cities went out of existence. In fact, many cities that were built in the phase of hydraulic civilization on a river have since been buried under sand. Acropolis in Greece, Memphis in Egypt, Persepolis in Iran, the Oudh in India have died and now are forgotten. They have disappeared in the process of wear and tear, or unplanned over-crowding, failure in water supply, sewerage, waste disposal or cruel negligence or various other causes, several or all taken together. If steps are not taken in time, it is not unlikely that Dhaka with its phenomenal rise in population and its phenomenal weight of waste should cease to live and grow.

Everyday we, in Dhaka City, produce more than 3500 metric tons of solid waste and only 42% is collected by City Corporation. The accompanying inadequacy in sewerage, water-supply, transportation system, power-supply, education and community-facilities with all its health hazards and degradation of living environment will only reinforce and hasten the decline of the city. Dhaka appears to me as a "City on Pendulum" swinging between inevitable decline and death on one hand and survival and progress on the other.

In combating solid waste, the developed countries have mostly resorted to combination of four methods, applying them all together or severally or individually suiting the local needs and capacity. Methods are Landfill, Incineration, Source Reduction, Recycling and simultaneous legislative compulsion to require the manufacturers to retain responsibilities for their products until those products are reused. All these methods are high capital intensive and sophisticated maneuver.

The quantum of waste is high in this part of the world due to higher density of population. Besides, the tropical climate with higher level of rainfall and humidity aggravates the problem of solid waste disposal, since the common waste disposal method in Asia is open dumping. The level of leachability from the dumped waste increases as a result of high precipitation. With rapid and unplanned urbanization, multifarious health and environmental problems are compounded.

Coming back to Dhaka, it is clear that the resources and ability of Dhaka City Corporation for handling waste - problem are extremely limited. The amount to be handled is colossal and the quantity is consistently increasing every passing hour. Obviously, the efforts of different agents at different levels, such as private sector and community initiative need be pooled together. This approach is being encouraged by the Government of Bangladesh through its policies and programs.

I congratulate Waste Concern that they, dealing with the component of the UNDP sponsored Sustainable Environment Management Program (SEMP), are implementing the community based solid waste management. The focus is to turn organic waste into wealth, into compost for onward use, much like the concept of industrial ecology. I know, only this effort is not enough and it is rudimentary and still this can serve a as model, as an eye-opener and a good beginning of a task, which needs be successfully accomplished. Their idea of producing compost and the way they are dealing with the issue of organizing community participation is simple, comprehensible, easy to grapple and adopt and quick - result yielding. In the given circumstance, Waste Concern is doing a fine job. I must mention Mr. Maqsood Sinha, General Secretary of Waste Concern for his dynamic role in the program. I know him personally. He is young, energetic and a man of ideas. I am sure Solid Waste disposal program of Waste Concern will expand further and will be a success story.

I hope that this two day's seminar will bring out valuable lessons on Community Based Solid Waste Management including intensive strategies for scaling up more efficient methodology of composting and waste disposal. We should also be able to find effective ways and means to enlist municipal and specially community participation and involvement.

Thank you

ADDRESS OF THE SPECIAL GUEST

Syed Marghub Murshed
Secretary
Ministry of Environment and Forest
Government of the People's Republic of Bangladesh

Honorable Chief Guest, Distinguished Guests, Learned Participants, and Ladies and Gentlemen,

It is my privilege to be here in your midst at this important Regional Seminar on Community Based Waste Management organized by Waste Concern with assistance from the Regional Urban Development Office (RUDO) of the United States Agency for International Development (USAID) in conjunction with the Urban Management Program of the UNDP. I wish to thank Waste Concern and its General Secretary A H Md. Maqsood Sinha and Asstt. General Secretary Iftekhar Enayetullah for organizing this important seminar.

The problem of waste management is as old as civilization itself. With rapid urbanization in the wake of industrial revolution, the problem began to grow more serious. The problem grew more complicated with the arrival of non-biodegradable plastic containers and polythene wrappers. The disposal of garbage continues to be at present, as it has in the past, one of the most irritating problems for urban communities. The problem is most acute in the mega-cities of the third world which are the ultimate destinations for the poor from the adjoining rural areas.

Large cities often spend half of their budgets trying to deal with the solid waste problem without effectively solving it. The operational inefficiencies of the various civil authorities, responsible for handling this problem, leave the waste generated by a large sections of the population inadequately attended. Often suitable sites for waste disposal are not available and as the piles of rubbish keep getting bigger, the environment as a whole, is adversely affected.

Urban solid waste management is among the most serious environmental problems that confront city dwellers as well as civic authorities in Asia. The authorities are often unable to collect and dispose waste efficiently. They are in many places incapable of recycling waste or recovering valuable resources from the heaps of garbage they are expected to deal with. Solid waste remains undisposed on the pavements of streets or finds its way into drains which they pollute. Public health is usually the casualty victim of inefficient waste disposal systems.

To tackle the problem of waste disposal, experts often talk of the '4Rs' – reduce, reuse, recycle and recover. The amount of waste generated in a particular area has to be reduced to the minimum possible level; whatever can be reused must be reused; as much as possible of whatever remains has to be recycled and energy has to be recovered from the rest. The residue can be used to fill land for urban development.

While municipal authorities often consider the waste accumulated within their jurisdictions to be a nuisance, they can include the garbage they fail to dispose among their assets. What we refer to as rubbish can often be a resource. What is thrown away by one person as waste can, really always, be used as a raw material by another. Kitchen waste can be used as manure by the farmers. Human excreta can be converted into energy in the form of bio-gas. The plastic containers and polythene wrappers that clog drains can be recycled. To do all these, civic authorities need to involve Community Based Organizations (CBOs) and local Non-Government Organizations (NGOs). The civic authorities in Asia have to develop their capacity to deal with the waste disposal problem as well as development partnerships with local groups who can help them to dispose waste.

In the towns and urban settlements of Bangladesh, as elsewhere in Asia (particularly South Asia) waste disposed has become a serious problem. The migration of rural poor to urban areas is a continuous process in a country where rural poverty is widespread. This unending migration process further aggravates the problem of urban solid waste management. The city of Dhaka, according to the census of 1951, had a population under a quarter of a million. In 1971, the year Bangladesh gained independence, the population of Dhaka was 1.7 million. The population of the capital of Bangladesh is expected to cross the 10 million mark in 2001. The sleepy little provincial capital of 1951 has become a mega-city. Dhaka, where the municipal authorities are able to deal with less than 40% of the garbage the city accumulates everyday, may, in the not too distant future, be filled with

mountains of litter. Life in Dhaka, already among the most polluted cities in the world, may soon become an environmental nightmare.

Ladies and gentlemen, I am not a pessimist. I do not expect the worst to happen. We have seen how the decline of Calcutta, a neighboring South Asian City, be reversed. We can do the same in Dhaka. I am familiar with the work done by the people in Waste Concern. Under the auspices of the Sustainable Environmental Management Program (SEMP) of the Ministry of Environment and Forests, they have developed a project to convert kitchen waste into environment friendly fertilizer. Communities have to be sensitized about various aspects of waste reutilization and motivated to work with the authorities to make the best possible use of waste. To do this, local groups (NGOs and CBOs) have to take a leading role. I hope through innovative initiatives from groups like my friends from Waste Concern—we shall be able to deal with and overcome the problem of solid waste disposal in Bangladesh. The problem is difficult but not insolvable.

PART III

COMMUNITY PARTICIPATION IN SOLID WASTE MANAGEMENT AND PROSPECTS OF COMMUNITY BASED WASTE RECYCLING AND RESOURCE RECOVERY

TRANSFORMING WASTE INTO RESOURCE AS A BASIS OF BUILDING NEW URBAN COMMUNITY : AN OVERVIEW OF REGIONAL EXPERIENCE

by

A. T. M. Nurul Amin

1.0 INTRODUCTION

"Urban waste will be the gold mine of the future", wrote Jane Jacobs thirty one years ago in her book, *The Economy of Cities*, which has contributed to keep the hope alive on cities' leading role in economic growth and development. Turning to our region, Indonesia's Hasan Poerbo's name fares in my mind as a source of inspiration for writing this paper. To convey his simple message that *waste is a resource*, Maqsood Sinha and I started our 1995 RDD paper (Sinha and Amin, 1995:173) by quoting him. His experience seems to be relevant for the ideas that I want to share with you in this seminar. Let me start by quoting him as we did before:

> "two approaches to waste management – the formal and the informal which represent two different views of waste. One considers urban waste a health and environmental hazard, and believes that every step should be taken to protect the environment against it. The other considers urban waste as an economic resource from which marketable products can be delivered".
>
> Poerbo, 1991: 61

To many Jane Jacobs' urban wastes-gold mines parable will appear too far-fetched even if we extend her definition of innovation from its modest sense – "adding new things to the old" – to include the amazing technological innovations that may one

day, indeed, make urban wastes as gold mines. But what about Poerbo's way of seeing the waste-resource parable? It is unlikely that to many the latter will strike as too far-fetched. Through his work in the Indonesian City of Bandung, Poerbo demonstrated that waste-based community building is possible. That waste is indeed a resource to far too many people can hardly be ignored today. What is the basis of waste's 'resource' attribute? Is its reusability? Is it Poverty? Too many people? Limited real resources? Human ingenuity? All of this – perhaps more facts – offer some explanations but no one singularly explains the whole truth of waste becoming a resource. Waste's resource attribute has not come from the work of Dhaka's *tokais* or Cairo's *zabbaleens* or their lives only. Many entrepreneurs – in the poor as well as rich countries – have been discovering waste's resource potential. In this paper, I ask: how real is that waste is truly a resource in the sense that land or water is? If the land as a resource has given rise to one of the first and most pervading human occupation for living – farming, could resource-recovery from 'wastes' become a widespread occupation? What stands in the way of this trend? This paper attempts to answer these questions for the purpose of contributing to choosing our (we, the community of waste generators) attitudes towards wastes and thereby infuse respectability and esteem to resource-recovery related occupations. I will attempt to extend this line of thought for potential building of new urban communities based on waste as resource. Finally, I shall suggest what need to be done at individual, household, community levels of *waste generators* and in parallel to that what need to be done at individual, household and the community of resource recovery. Also will be included the essential institutional roles in all this (especially at the various scale of local levels) for helping to forge partnership between the waste-generating community and the resource-recovering communities.

2.0 CHANGING ROLE OF PARTICIPANTS IN THE SOLID WASTE MANAGEMENT: AN OVERVIEW

Table III.1 Participants' Respective Role and Their Significance : A Summary from Research Findings

Participant	Role	Significance
Community	♦ Community role in SWM has traditionally been as a recipient of waste disposal service. It is now moving more in a direction of active participant in waste	♦ Community is currently not only a service receiver or customer, but also becoming a service provider through participation in various levels and aspects of SWM.

Participant	Role	Significance
	reduction, source separation and composting (backyard composting). ♦ Getting increasingly involved in waste collection and street sweeping within respective neighborhood boundary. ♦ Increased participation in SWM-planning.	♦ Providing human resource and innovative ideas. ♦ Looking for accountability and cost-benefit thus improving efficiency in SWM.
Informal Sector	♦ Actively participating in resource recovery, recycling and reducing volume of Wastes to be finally disposed of (i.e., at transfer stations, dumpsites and landfills). ♦ Increasingly involved in waste collection and transport from generation points to transfer stations.	♦ Involvement in SWM is self-developed by income-earning motivation. ♦ Its performance is not stable under market-driven mechanism. ♦ Still working in conjunction with public and the formal private sector.
Government (i.e. Municipal Governments)	♦ Operating and managing SWM services such as waste collection, transport to final disposals, landfills, incineration, and compost plants. ♦ Monitoring and supporting SWM services provided by other participants. ♦ Protecting the rights of citizens. ♦ Educating the public to improve or change their behavior and attitude regarding SWM. ♦ Establishing and strengthening appropriate legal and regulatory framework regarding SWM and for various stakeholders.	♦ Municipal government is currently not only service provider, but also becoming facilitator to support other participants involved effectively and efficiently in SWM. ♦ To ensure efficient collaborations between and among stakeholders and quality of services provided by them.
Formal Private Sector	♦ Getting involved in various SWM activities (i.e., collection, transportation,	♦ Privatization is a reliable approach to improve efficiency of SWM,

Participant	Role	Significance
	materials recovery, incineration, composting, and landfill operation). ♦ Participating at different levels (i.e., various forms of participation from providing capital investment, operating services to managing services).	especially in developing countries. • Help reducing burden of service provision (administration works) on municipal governments. • Provide necessary capital investments to SWM that government budget cannot afford. • Ensure infusion of cost-profit sense and accountability in service provision. • Creating competitive environment provision that help reduce costs and improve the efficiency of SWM.
NGOs	♦ Supporting CBOs or the informal sector in SWM activities. ♦ Providing them with technical training and assistance. ♦ Getting involved in negotiating with municipal governments and the private sector.	♦ NGOs act as advocates or facilitators in particular improvements of SWM. ♦ Render useful intermediary role in negotiations.
Others (Volunteers, Educational/ Research Institutes, etc.)	♦ Offering public education programs. ♦ Providing knowledge and technical training regarding SWM. ♦ Undertaking research to constantly updating the changes.	♦ Supporting and advocating role for improving SWM. ♦ Propagating new and innovative approaches.

Source: Compiled from Taylor (1999), Furedy (1992, 1999), Foo (1997), Lober (1996), Noor (1994), Mehra, *et al.*(1991), Barton *et al.*(1991).

3.0 TURNING WASTES INTO RESOURCES

EGYPT

CAIRO'S ZABBALEENS HAVE TURNED WASTE INTO GOLD!

A recent advertisement in the Far Eastern Economic Review (17th February 2000) has a citation on the *zabbaleens* under a banner heading of: *How Cairo's waste has been turned to gold.* The advertisement invites submission of projects for a competition, *Dubai International Award for Best Practices to Improve the Living Environment for the Year 2000* and the citation goes as follows:

> The *zabbaleen* garbage collectors in Cairo have turned solid waste into a king's ransom. Collecting 600 tons of domestic wastes a day, and selling products made from recycled garbage they have tackled the age-old problem of poverty and urbanization with a new initiative. A shining example of how waste management can become an income-generating activity, and provide better living for the urban poor.

The *zabbaleen* system in Cairo is perhaps the oldest example of refuse collection system. Assaad (1996:118) traces its origin to a 1670 guild of *zabbaleen.* Literal meaning of it is garbage men (singular: zabba). The system has undergone several transformation. The latest one took place in the late 1980s. Although it started with a decision of Cairo's municipal authorities to replace the city's informal collection system with a more "modern" system "[a] drawn-out process that involved various forms of resistance, mediation, negotiation, and compromise finally resulted in an accommodation that partially satisfied the needs of the municipal authorities for regulation and oversight without jeopardizing the social norms, practices and rights that were the mainstay of the informal system " (Assaad, 1996:115).

A very detailed and scholarly investigation of the recent transformation of the *zabbaleen* system by this author suggests that neither a total *laissez-faire* approach to the indigenous system nor a total formalization can produce desirable result. Partial formalization- I have elsewhere advocated for a *service-rendering regulation* i.e., a carrot and stick approach-. is more realistic for better utilization and management of informal activities since offering of basic services (such as water, toilet and space to locate their activity and shelter for living) will motivate them to be cooperative with the regulating bodies which seek to improve the overall quality of city living.

INDONESIA

Hasan Poerbo has not only been the source of intellectual inspiration but has also been the leader in implementation of a resource recovery system for urban solid waste management in Bandung, based on a community of "scavengers". The guiding principle of the project, styled as, Integrated Resource Recovery System, has been:

> " ... to develop an alternative waste management system which removes wastes economically, with low investment costs, which is socially and politically acceptable and which is sustainable because it finances its own operation" (Poerbo, 1991:62).

While the above has been the theoretical basis, in operational terms, the project centered around transforming wastes into resources through the work of the "scavengers" and building a "productive community". Over a three-year period, the work under the project included:

- Intensified sorting of wastes and selling of recovered materials (paper, plastic, glass and metal can, etc.)
- Aerobic composting of organic waste and selling of the product for intensive urban farming by the community itself
- Introduction of seed farming, using seeds collected from wastes
- A three-month old seedling of various fruit plants
- Rabbit-raising by the community
- Shelter improvement
- Savings cooperative
- Grocery cooperative
- Health care, childcare and mother care services by the municipal health department.
- Building of a double-pit public toilet with UNDP support

The process of resource recovery module was designed as an integrated whole with a clear layout of constituent parts: *sorting place, composting area, warehousing facility* for raw and finished materials, *sales department, management office* and *basic services* (bath, toilet, energy generation). Each "module" covered 1,000 square meters to serve between 25,000 to 30,000 inhabitants.

Although Bandung is not yet an Integrated Resource Recovery System, it did succeed to build a community based on resource recovery activities with "composting forming the backbone", wrote Poerbo in 1991.

In a recent study, Romanos and Chifos (1996: 131) report that each of the districts in Bandung has between 1-14 *lapaks,* or leaders of "scavenger" communities who are able to employ between 11-60 scavengers, which make the total number of "scavengers" in the Bandung area today between 2,000 and 3,000.

THAILAND

Until the economic boom period (1987-1996), informal sector's involvement in resource recovery from wastes had been quite widespread in Thailand. Overall increase in income during economic boom was accompanied by a labor shortage and rapid increase in wage rate, which led to a substantial reduction of involvement in waste separation for resource recovery. For example, the number of hawkers, who used to go around the residential area to buy itinerant items got, significantly reduced during good economic time (a reverse trend did take place with the collapse of the boom by middle of July 1997). The formal waste management authority, particularly the Bangkok Metropolitan Authority (BMA), did respond to the situation by making use of the municipal collection crews for upholding waste separation practices of the households. With two or three separate trucks, the collection crews go to their routes and announce their arrivals by loudspeakers. Date for collection of separated recyclable wastes is arranged by consultation with the community heads. Unlike the opportunity in the previously existing informal system to sell wastes with a market value, households do not have any incentive to separate wastes to give to the collection crews since they do not buy.

Thus, the BMA initiative has not been that successful although some households do still separate wastes and make good use of BMA-provided separate waste bins and trucks for conveniently adopting the waste disposal practices. But such environmental awareness-based waste disposal practices could not be counted upon much for the slum communities. It becomes clear that economic incentives work better for those who are income and education-wise much behind. At the backdrop of this, a community initiative emerged for giving incentive to promote recycling. The result is the now famous, *free eggs in exchange of wastes* program in the Klong Toey Slum of Bangkok. It started working in 1997, led by the head of the 70-Rai Community, Khun Wallop (Thepkunhanimitta, 1998).

"Free Eggs in Exchange of Wastes" Program in Bangkok Klong Toey Slum

Popularly known as, "Garbage for Eggs", this program is a unique community based initiative to encourage its residents to separate their solid wastes. This is based on a simple incentive mechanism: people get some eggs as an exchange of collecting and separating solid wastes (mainly domestic) voluntarily. The cost of the operation is met by selling the recyclable to the secondary collectors. This approach eases the waste problem of this largest slum community in Bangkok. It has also generated some employment for the poor in the community.

Because of too many people living in a small piece of land (70-Rai Community) without adequate basic infrastructure and services, lack of solid waste dumping facility, the place's living condition became miserable. People used to throw their wastes here and there causing blockage of natural drainage. Due to this, water logging and flooding in the community has been a common phenomenon.

Soon the community realized that the government efforts to solve the waste problem are not sufficient, they started thinking to do something on their own initiative. They decided to establish a waste recycling shop in the community where the residents would get money in exchange of garbage. But this idea had to be discarded because of cultural reason: Thai tradition and culture reportedly do not see the selling of garbage very positively. Realizing that people would not be encouraged to sell their wastes in a recycle shop, the community decided to exchange the separated wastes with eggs. The operation is done once in a week (every Sunday morning). Housewives, children and aged people living in the community are the key actors in availing this opportunity. They separate the recyclable from the waste stream at household level and place in different plastic bags. Separated items are then properly wrapped and brought to the exchange center. No transportation cost is incurred in the process of such collections, which are then accumulated in the exchange center and further sorted into different categories and then sold to the local junk dealers.

Liquid Detergent from Organic Wastes in Nakorn Pathom

Another notable waste-related community initiative in Thailand is yielding liquid detergent, produced through fermentation of organic wastes. This liquid is later used for cleaning toilets, treating waste water, controlling odor and waste. The

process involves a very little (almost negligible) investment and the rate of return is very high (estimated to be 8:1). At present several hundred poor people in Nakorn Pathom are engaged in this business which they find very attractive since the marketing potential of the product is very high because of its low cost.

CHINA

Changing Trend in Waste Recovery and Recycling Practices in Wuhan City

A study on solid waste recovery and recycling practices in Wuhan City reveals a declining trend in resource recovery because of a change in the system. In recent years the municipal government has become less involved in waste recovery and recycling. Tao (2000) makes a comparison between the waste recovery and recycling practices before and after the Chinese reform that suggests waste recycling activities in their cities in general and the city of Wuhan in particular have declined after government's adoption of market reform and more open policy. He argues that before the reform, China had less vigorous urban economy, which led many dwellers of Wuhan City to depend on petty trading for making their living. This trading involved selling recyclable to junk shops. But with the reform and open policy, the Chinese economy in general and the economy of Wuhan have become more developed and the income of the citizens has also increased. As a result, a fewer city dwellers are now interested in selling recyclable to petty junk shops. This is causing a declining trend in waste recycling. Although it appears to be consistent with a not-too-unknown inverse relationship between economic development (as has been the case in Thailand during economic boom) and recycling at certain stage of development, it is unlikely that this will persist long since huge waste generation and growing environmental concerns and awareness is bound to force all concerned to resort to recycling more vigorously in the days ahead.

VIETNAM

Officially SWM in its two large cities- Ho Chi Minh and Hanoi- is still very centralized, hierarchical and bureaucratic. Functionally divided government "companies" are entrusted with specific responsibility of collection process, transportation and treatment of wastes. Although government-run composting factory exists in both cities, absence of effective waste separation on the supply

side and a limited interest of the farmers to use compost on the demand side (because of non-competitive cost and price of composts *vis-a-vis* chemical fertilizer) have led to a stop of compost production.

Notwithstanding the official attention to conduct a comprehensive SWM system, the informal sector plays a major role in material recovery and recycling. For example, in Hanoi, the amount of recyclable collected by the informal waste collectors (i.e. through door-to-door collection) and wastes pickers (i.e. streets and dumpsites waste pickers) account for 15% of total wastes generated in the city (Thai, 1999:51). Resource recovery-recycling system is loosely organized in a three-tiered network of collectors, small traders and dealers (Dung, 1999:43). This system is accorded a legitimacy on payment of some taxes and then is titled to receive some assistance and support from the municipality. Such assistance includes soft loans, technical assistance to improve the working conditions and quality of materials recovered.

CAMBODIA

Resource recovery from waste and their recycling is on rise in Cambodia. A recent study on the Phnom Penh informal labor groups and enterprises involved in resource recovery activities show that "hetchai" buyers "play a very important role in collecting recyclable materials from households." (Chanthy, 1999:125). The collection crews, street waste pickers and dumpsite waste pickers are other major groups engaged in resource recovery. About 85% of solid wastes are of organic nature, yet, composting is not yet a notable practice. Because of limited number of local industries and workshops to use recycled items as raw materials, a large quantity of papers, metal and bone items are exported to Vietnam and Thailand.

PHILIPPINES

Collected Ashes Turned into Fertilizer

In several Philippines localities, "scavengers" collect ashes that result form spontaneous combustion. This combustion often occurs at the open dumps that receive bulk of wastes generated. The ashes are then sold to farmers to be used as fertilizer. Scavengers also collect fish bones and other discarded fish parts to be sold to 'patties' (fish sauce) makers.

Source Separation Project of Regional Women's NGO

The Metro Manila Council of Woman Balikhtan Movement Inc. (MMCWBM), a regional women's NGO; has been successful in initiating and implementing a project on waste separation in San Juan City Municipality which is believed to have contributed significantly in the city's waste management system. The project has been successful in establishing an effective partnership among the NGOs, traditional waste collectors, recovered material dealers and individual households. In the project, the individual households are encouraged to separate their wastes into wet and dry components. The 'ecoaides' (i.e. waste collectors) pay the households for the dry recyclable component. They are recruited and supervised by the dealers whereas MMCWBM is responsible for routing and scheduling for ecoaides.

MEXICO

Leftover Food Collectors in Mexico City

In Mexico City, waste pickers recover animal bones used in making glue. They collect leftover food, which they boil and then either consume or feed their pigs. They also collect discarded fruit, and other animal's parts and then use them as cattle feed. In some areas in Mexico, farmers collect food leftovers from nearby dumps which can be used as fertilizer without any previous process, such as composting. Mexican farmers call this process as "basurar" the land (apply garbage to the land).

PAKISTAN

In this region, especially in Bangladesh and Pakistan, the name Akther Hameed Khan commands a lot of respect for his people-centered developmental activities throughout his life. While in Bangladesh he became famous (like today's Dr. Muhammad Yunus for the Grameen Bank), for a community approach to cooperatives for rural development, since his return to Pakistan he engaged himself for improving the living condition of the urban poor. This led to the establishment of the famous, Orangi Pilot Project (OPP) in the slums of Karachi. As reported by Hoq and Lechner (1994:30), Akhter Hameed Khan was upset by the appalling condition in the Karachi slums: "the streets were filled with excreta and waste water, making movement difficult to get them to finance anything else". Poor initially perceived that Dr. Khan will be able to persuade the Karachi Development

Authority (KDA) to provide service free but it was not to be the case—good that it did not come that way (It is in order to note here nothing has been more harmful in the South Asian countries with respect to governance as it has been from promoting a culture of free service, often made in the name of the poor, although the poor has been the biggest casualty of this culture since municipalities as a result of perennial financial limitation cannot organize basic service delivery even for half of its population).

Failing to persuade KDA, Dr. Khan decided to work with the community. One result of this has been the OPP as noted above. Although primarily focused on the provision of sewage service for the poor, the agenda for action on wastes include a three-prong strategies according to the income level of a community.

For the upper income communities, strategies focused on:

- reducing waste production,
- clearing up the degradable amount,
- raising awareness for environmentally desirable waste disposal practices.

For the lower income communities, actions focused on:

- soil and water conservation,
- biogas production,
- waste recycling.

Overall, community actions are to be focused on:

- identification of need for community participation;
- levying a waste disposal service fee.

Recently Arif Hasan has studied the impact of the OPP, which shows considerable success of and interest in to replicate OPP programs by either organizations to develop their own ones. The OPP principles of reliance on the community, social and technical guidance for collective action (Hasan, 1999:183) are particularly relevant in building and improving communities of the poor like waste pickers.

INDIA

Waste Recovery and Recycling in Bangalore

Bangalore, the sixth largest city of India, is able to recover and recycle the majority of its generated wastes. The main actors in this recovery and recycling process are waste pickers who are counted to be at least 25,000 in numbers, retrieve about 15% of the city waste from over 12,000 street bins amounting to 300 tons of materials per day. An amazing recovery and trading network has been developed in the city where apart from waste pickers, other actors are: itinerant waste buyers (3,000-4,000 nos.), small dealers (800 nos.), medium dealers (50 nos.) and wholesalers (50 nos.). A series of recycling industries in this city of 4.1 million based on the collected materials: two glass recycling plants, four paper recycling plants, eight aluminum recycles and 350-400 plastic factories bear the sign of a thriving waste recycling economy. A rough estimate shows that approximately 40,000-50,000 people in the city earn their living by waste recovery and recycling, which accounts for about 2% of the city working population.

The above achievement in resource recovery in Bangalore has been underlined by the Waste Wise project (Furedy, 1997), launched and implemented by an NGO-REDS and some donors. The project focused on creating legitimacy of informal waste workers and improving their living conditions. Participating households are provided with bamboo baskets to separate wet wastes and dry them into compostable and insanitary wastes. Door-to-door collectors take organic waste to compost site, sell recyclable and dispose of the residues to communal bins.

Calcutta: World's Waste Recycling Capital!

For long the huge urban agglomerations of Calcutta has a waste recycling system based on a key role of rag-pickers who sort the recyclable materials from the city's waste stream. The materials are then directed to different industries after classification according to their characteristics. An estimated 20,000 waste pickers—mostly women and children—are involved in this resource recovery process. Other actors in the waste recycling chain are households, collectors, traders and transformers. A number of semi-mechanized recycling industries have been emerged in the city with the help of local technology. The main recyclable materials are: waste paper and cardboard, plastics, glass, etc., which are turned into board, polythene, bottle and jars after recycling and processing. The good thing

with Calcutta's waste recycling is that almost all of the wastes are separated at the source. Some popular media coverage (e.g. the one which ran like this: "anything edible is picked out of the waste stream almost at the source. Food that is not consumed by hotel or restaurant workers, servants or beggars, is gobbled on the streets by cattle or dogs."), and involvement of children in recycling have, however, led to some government actions in recent days to reduce the negative elements associated with recycling. It has long been said that Calcutta is "the waste recycling capital of the world".

NEPAL

Thapa (1998) observes that external resource based solid waste management (SWM) is not sustainable in the low income developing countries. His case study of Katmandu clearly shows that reliance on a GTZ supported project since 1981 for SWM in Katmandu has led to a total collapse of the previously existing cooperation between local people and their municipal authority. During the project period, the responsibility of city's SWM was taken over by the solid waste management and resource mobilization center (SWMRMC), although the municipality continued to be involved to some extent. The researcher singles out the following as the reasons of the failure of this project:

- The project undermined the traditional participatory management system under the leadership of the municipality.
- SWMRMC's independent status led to lack of coordination between the municipality and this center.
- Municipal authority eroded due to autonomous status of SWMRMC.
- Project's assumption that people could not afford to pay a fee for SWM which did a disservice to the need of local resource mobilization, although this featured prominently in the name of the center itself.

BANGLADESH

Turning here to Dhaka, I ask how did the Waste Concern-organizers of this regional seminar come into being? Who is this Maqsood Sinha-the name that drew attention of many Bangladeshis since BTV's profiling of his concerns on wastes. As an architect-planner, he understandably became interested in the piles of unsightly wastes in Dhaka's neighborhoods, streets and market places. But as he got more involved in the work for seeking solution, instead of becoming overwhelmed by the magnitude of the problem, he kept cool and discovered that solution lies in

the problem itself. He quietly discovered, by tracing all actors/groups in the process of Dhaka's vibrant recycling as reflected in a masterly produced VDO, the strength of the informal system. The bright eyes of the young *Tokais* around the disposal sites in the neighborhoods and in the final dumpsite must have moved him beyond his original concern for the unsightly waste littering in his dear city Dhaka.

The work that began with a limited scope of doing a research as part of his master's thesis is now getting citation in regional and international events. Recently (8-11 September 1999), his work was proudly displayed in a panel by his alma mater-the Asian Institute of Technology (AIT)-as part of an exhibition organized in commemoration of AIT's 40th Anniversary when hundreds of AIT alumni from all over Asia and the Pacific region and other key partners of AIT including its donor community joined in a Stakeholders' Forum.

The display materials included seven photos, all are shots taken by Sinha himself, illustrated a truck dumping garbage, an approaching bulldozer, a young girl raking garbage, three *tokais* in their round of waste picking, a bicycle collection cart driven by a man whistling in the Kalabagan residential area of Dhaka city as he is on his round of door to door collection of wastes, an extract from RDD (*Regional Development Dialogue*), in which Sinha published a paper with supervisor (Sinha and Amin, 1995) and a poster of *Waste Concern*. An AIT committee selected Sinha's work for the exhibition being impressed by its quality and the message it could give to an international gathering. The caption of the display boldly stated:

"In nature, there is no waste".

And the narrative on the display had the following to say:

- Asian City administrators are beginning to learn the wisdom of cycles. In Dhaka, thousands of people make a living collecting and recycling rubbish while the city struggles to cope with a waste problem. An AIT graduate formed Waste Concern to improve linkages between formal and informal ways of doing things.
- Waste Concern is helping these boys build a future. May be they can send their children to school.

4.0 CONCLUSION

This is no small measure of recognition of Maqsood Sinha and his Waste Concern. Let us hope the path shown by this enterprising young man will inspire many more

to work for truly turning wastes into resource as the Waste Concern is doing through its contingent of *tokais*, composting plant and marketing channels of produced composts. As one of the most material resource-scarce economy, its only option is to make resource by making use of its abundant labor. This will have to be done even if it is out of global stocks of discarded wastes, excluding the hazardous ones though. From such a perspective some twenty years ago I got inspired by the recycled material-based informal workshop system of Dholaikhal area in Dhaka, which has been the basis of my hope to see greater unleashing of human ingenuity for broadening of our disadvantaged children's technical skills and eventual urban skills industrial transformation of Bangladesh economy.

REFERENCES

Amin, A. T. M. N. (1991). "Guidelines for Effective Utilization of the Informal Sector in Urban Waste Management", Division of Industry, Human Settlements and Environment, UN-ESCAP Bangkok, Thailand.

Assaad, R. (1996). "Formalizing the Informal? The Transformation of Cairo's Refuse Collection System", *Journal of Planning Education and Research*, 1:115-126.

Chanthy, L. (1999). "Strengthening Recycling by Promoting Waste Separation at Source: A Case Study of Phnom Penh Households and the Informal Sector", Master's Thesis, AIT, Thailand.

Dung, T. T. K. (1999). "A Study of Explore Application Regulatory and Economic Instruments in Solid Waste Management in Hanoi City", Master's Thesis, AIT, Thailand.

Furedy, C. (1997). "Household-Level and Community Actions for Social Waste Management and Recycling in Asian Cities", Recent Research and Projects, in A. L. Fernandez (ed.) *Recycling in Asia: Partnerships for Responsive Solid Waste Management*, UNCRD, Nagoya, Japan, pp. 13-31.

Hasan, A. (1999). The Informal City. *Regional Development Dialogue*, 20(1):168-183.

Hoq, M. and Lechner, M. H. (1994), "Aspects of Solid Waste Management: Bangladesh Context", German Cultural Center, Goethe-Institute Dhaka,131 pp.

Poerbo, H. (1991). "Urban Solid Waste Management in Bandung: Towards an Integrated Resources Recovery System", *Environment and Urbanization*, 3(1):60-69.

Romanos, M. and Chifos, C. (1996). "Contributions of the Urban Informal Sector to Environmental Management", *Regional Development Dialogue*, 17(1): 122-155.

Sinha, A. H. M. M and Amin, A. T. M. N. (1995). "Dhaka's Waste Recycling Economy: Focus on Informal Sector Labor Groups and Industrial Districts", *Regional Development Dialogue*, 16(2):173-195.

Tao, Z. (2000). "An Analysis of the Role of the Municipal Government, Informal Sector and Households in the Waste Recycling Economy of Wuhan City, China", Master's Thesis in Progress, AIT, Thailand.

Thai, P. D. (1999). "Development of a Strategy for Municipal Solid Waste Disposal: A Case Study of Hanoi City, Vietnam", Master's Thesis, AIT, Thailand.

Thapa, G. P. (1998). "Lessons Learned form Solid Waste Management in Katmandu, Nepal", *Elsiver Science Limited*, 22(2):97-114.

Thepkunhanimitta, P. (1998). "Formal and Informal Sector Linkages in Waste Recycling: A Case Study at Prawate District in Bangkok Thailand", Master's Thesis, AIT, Thailand.

COMMUNITY BASED DECENTRALIZED SOLID WASTE MANAGEMENT SYSTEMS: FORGING NEW PARTNERSHIP

by
Anselm Rosario

1.0 INTRODUCTION

Municipal Solid Waste Management (MSWM) is one of the serious environmental issues confronting the governments of major Indian cities. The local authorities-municipal corporations/councils are formally responsible for provision of this service. It is a complex task consuming 30 to 40% of the municipal revenues and involves a variety of actors from small/large generators of waste, to private sector and officials. Its efficiency and effectiveness largely depends on appropriate technical and managerial solutions for collection, transfer, recycling and disposal of waste. For variety of reasons, local bodies are unable to manage the problem satisfactorily.

2.0 WASTE WISE (WW) – ORIGINS

Waste Wise is a project of Mythri Sarva Seva Samithi-a registered non-profit Trust, which began its work among the waste pickers of Bangalore in early eighties. A shelter cum drop in center that provided health care, education, vocational training, recreational facilities and protection for waste pickers came into operation during 1985. In course of time, WW discovered the relationship between increased quantities of waste in the city and greater presence of waste pickers on the streets.

It was a time, when plastics began to appear in large quantities in the Indian consumer market. The adult, male waste pickers who earlier dominated waste picking scene, gradually began to be replaced by women and children who entered waste picking profession for sheer survival in the urban scenario. WW was confronted with a reality for each waste picker rehabilitated, ten were coming on to the street. WW began dabbling with the ideas of clean waste procurement from homes and offices with an aim to prevent insanitary conditions of waste picking job. An idea to train waste pickers for door to door collection and revenue generation through composting using organic portion of garbage emerged during 1987. The learning curve stretched itself with small experimentation here and there. The idea gained maturity and the necessary props were obtained with funding from the Karnataka State Council for Science and Technology and Terres De Hommes (TDH), Geneva, Switzerland in 1990.

3.0 THRUST DURING NINETIES

Waste Wise evolved the community based decentralized solid waste management system with an ecological need to educate people to reduce waste generation and to avoid dumping by facilitating community based treatment of garbage near source. WW focus was to combine a social concern to recognize the jobs of the waste pickers, to render their working condition less hazardous and to enable them to gain public recognition for their role in recycling and protecting the environment. To this end a project was conceptualized to arrive at the following:

- Promotion of people's participation in garbage management
- Integration of formal and informal systems
- Creation of policy changes in SWM of the City

The general objective of the project was to create models for integrating formal and informal systems through community based cooperative approach to manage solid waste. Such models, it was hoped, would complement efforts made by municipal authorities paving the way for efficiency, accountability and sustainability in official systems.

4.0 APPROACH AND STRATEGY

In order to achieve these general objectives, WW strategy has been based on the following aspects:

a. To help neighborhood groups to come together through awareness programs on solid waste issues and empower them through interaction/technical/financial inputs and link them to formal and informal systems, eventually leading them to a decentralized community based solid waste management system. It is hoped that through service fee collection and composting in the neighborhood parks, the revenue generated would sustain the project financially.

b. Creation of such localized models at the city level would promote "Self-help" concepts in the citizens eventually leading the neighborhood groups to design and implement these programs according to their local conditions. This in turn would create responsibility and ownership in people paving the way for collaboration, accountability and complementary with the local authorities dealing with waste.

Put it simply approach of WW Stage I was to first create "demand" within the neighborhood and organize both the demand side at the local level and "response" side by NGO and GO, to that micro level demand. Through such a process it was deemed possible to create a sustainable model which would play an indispensable role at the city by promoting environmental awareness and responsible behavior.

5.0 CURRENT STATUS OF THE PROJECT

Waste Wise operates in 32 different locations in Bangalore promoting decentralized management of solid waste by the neighborhood groups. Some of the groups are functioning with complete process, *viz.*, collection, transportation and neighborhood composting, and some are involved in only collection and removal by the Corporation authorities. Yet others are in the early stages of formation of working group and linking with officials, sponsors and the like.

6.0 LESSONS LEARNT

An evaluation after five years of operating the project, it was found that despite many useful and appreciable elements of the strategy, a notable gap existed between potential and reality at various levels.

In course of time an interesting model of neighborhood resident groups concerned about garbage had emerged in localities where WW is involved. These groups were found successful only in high-income areas than in middle/low income areas. The

earlier groups who were helped in formation, did not contribute significantly towards capital costs or day to day running of the projects. They began to look at WW as an alternative to Municipal body. Resident's activity limited itself in terms of giving the garbage and paying the service charges. In such a situation, the whole burden of day to day operation of the project fell on WW and the limited full time staff of WW could not cope with problems arising out of implementation. Hence a lot of rethinking on approach, and involvement has taken place which eventually led to shift in strategy. The later groups that came into existence were supported indirectly for their initiatives. They were helped to look at management and financial component associated with a typical neighborhood scheme and make conscious decisions to obtain funds and manage the programs themselves. Waste Wise limited itself to providing technical support and identifying and training of waste pickers for door to door collection.

7.0 SHIFT IN STRATEGY AND IMPACTS

A major shift in WW strategy took place during 1995. A large coverage was initiated with funding from "Environmental fund for NGOs" promoted by the Ministry for Development Co-operation, Netherlands. Bangalore served as a setting to initiate decentralized model of SWM with the integration of Waste Pickers. The project of WW in various locations of Bangalore has resulted in well-articulated and strategies for implementation of CBSWM. Its impact is felt at various levels, from organized groups at local level to linkages and networking at the city level. Recent years has witnessed increased activism by resident groups, who are not only promoting self-help concepts but are also stretching the governmental agencies to the limit to provide basic services. In a democratic situation, residents taking up common civic issues that affect their lives and the neighborhood is a progressive and sustainable step, which needs to be pursued at all costs. Decentralized Waste Management by the neighborhood groups is but an entry point to tackle various ailments affecting our society.

8.0 EMERGING TRENDS AND OPPORTUNITIES IN RELATION TO CBSWM IN INDIA

Waste management problem in India is essentially structural and has resulted in evolution of a number of alternatives of citizen and private sector initiatives. A variety of models have emerged across the country and their successful contributions to solid waste management have created certain forms of structural evolution, which cannot be ignored by the authorities. The emergence of

decentralized waste management systems, the growth of private resident, NGO, CBO, waste picker combinations to address management of neighborhood waste have come a long way to complement the City's initiatives. However, by themselves they are not and cannot provide a complete or comprehensive solution to waste management problems at the city level. These trends across the country have sowed the seed for stakeholder participation, city level joint planning, transparency, accountability, laws and rules, which offer potential reform in functioning of City governments. The public Interest Litigation and the recent directive on "Municipal Solid Waste (Management and Handling) Rules 1999" is an evolution of citizen's concern and mitigation for the unsanitary conditions prevailing in the Indian cities.

Community based decentralized waste management systems flourish when the city authorities back them with their input and encouragement. One of the important features of this system is the "willingness to pay for their service". Such an attitude is remarkable in a no pay culture where public sector is traditionally forced to cover the costs. Unfortunately, this trend is not fully activated by the authorities. A decentralized waste management system amply demonstrates their effectiveness and sustainability and offers the following indicators for incorporation.

Strengths

- Personalized service with fair amount of client satisfaction
- Low operational and storage costs over a period
- Extensive knowledge of the local area, waste and residents' habits
- Residents and workers belong to same area and have common interests and shared responsibility
- Appropriate technology used with organized monitoring systems
- Balance between demand and capacity
- High recovery of organic and inorganic materials for recycling

Weaknesses

- Absenteeism and irregularity of the services of the waste pickers
- Less coordination with the municipalities
- Vulnerable to change of policies
- Lack of financial resources and administrative backups
- Difficulty to get clients to pay in time
- Turnover of personnel high

- Lack of unity among resident groups with few actively involved
- Difficult to replicate in large scale because of its site specific nature

Opportunities

- There is a strong demand for service
- Service offered can be extended and diversified to include street sweeping, drain cleaning and to other sectors
- Extensive potential for productive/safe employment
- It is consistent with privatization, decentralization, resource recovery and recycling policies
- Potential for multi stakeholder participation, local resource mobilization, and community education and site specific solutions

Threats

- Non availability of institutional support inhibiting growth
- No legal framework exists that can guarantee and regulate the system
- Competition when waste becomes a valuable resource
- Distortions in rates and fluctuations of market price

9.0 CONCLUSIONS

CBSWM is a sociological process by which residents organize themselves in a neighborhood to improve their environmental conditions and civic life. It comprises of various degrees of individual and community involvement. It produces a spirit of volunteerism, a friendship among neighbors breaking social barriers, community talent and capabilities, and above all understanding of democratic institutions and mutual rights and responsibilities. It facilitates new methods of urban management and a new relationship between city-dwellers and the authorities.

REFERENCES

Moreno, J.A., Rios, F.R., Lardinois, I., (1997). "Solid Waste Management in Latin America: The Role of Micro and Small Enterprises in Co-operatives", WASTE Consultants, Gou de, The Netherlands.

Sylvaine, B. (1999). "Issues and Results of Community Participation in Urban Environment", UWEP working Document II, ENDA/WASTE.

WASTE COLLECTORS ARE OPERATING A COMPOSTING UNIT ON NEIGHBORHOOD LEVEL: AN INDONESIAN EXAMPLE

by

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and
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1.0 INTRODUCTION

Urban areas are the focal point of environmental problems and these extend over a wide range of spatial scales, i.e., the household, the place of work, the neighborhood, the city, the wider region, and the world. In rapidly growing cities of the developing world, urban Solid Waste Management (SWM) is currently regarded as one of the most immediate and serious problems faced by urban governments. Inadequate or unavailable solid waste collection and services result in indiscriminate dumping of waste on streets and public areas, clogging of urban drainage systems, contamination of water resources, and proliferation of insect and rodent vectors. Such conditions increase health risks by direct human contact with solid waste, and constitute major factors in the spread of gastrointestinal and parasitic diseases. Even if the efficiencies of existing collection systems are improved significantly, a large section of the population will realistically not be served by municipal services, especially in low-income areas where insufficient pressure is exerted on municipalities to provide the necessary services. In other words, residents of low-income areas have to manage their own waste and develop alternative waste collection systems adapted to their economic needs.

Most municipalities are also responsible for the final disposal of solid waste. Inadequate disposal, often through uncontrolled dumping, poses a serious health risk to the population concerned and constitutes a major cause of environmental degradation in most cities of the developing world. Numerous dumps or landfills have almost reached their maximum filling capacity, and new sites are increasingly difficult to find or are located far from the collection areas, thereby, leading to high transport costs. One way to improve this state-of-the-art is to promote resource recovery. Recycling of different materials from municipal solid waste is often a well-functioning activity conducted by the informal sector. However, organic waste material, which often makes up more than 50 % of the total waste, still has an important recovery potential. From the perspective of solid waste managers, organic waste recycling not only reduces disposal costs and prolongs the life span of disposal sites, but it also reduces the environmental impacts caused by the sites, as the organics are mainly responsible for leachate contamination and methane problems. Recycling and returning of organic waste to the soil will significantly contribute to enhancing the sustainability of the urban world. Involving the population in the use of compost promotes awareness of the waste resource recovery and composting activities, creates employment and generates income.

The interest in composting plants grew world-wide and became quite popular in the 1960s when manufacturers offered large-scale and highly mechanised plants (Alter Ego *et al.*, 1996). The reason for promoting such large-scale and highly mechanised plants was to reduce the production costs through an economy of scale and to produce a standardised product of high quality. Plant-manufacturers convinced national governments, particularly in developing countries, that composting and the produced organic fertiliser would solve their disposal problems. Since performance of most of these capital-intensive, large-scale and highly mechanised composting plants built in cities of developing countries in the 1960s-80s was poor, production was often stopped shortly after start up, in almost all cases long before the plant's depreciation time. Such composting projects turned out to be serious financial failures for the governments, and composting as such therefore lost its reputation irrespective of the technology applied.

This paper presents a pilot project initiated by SANDEC and Yayasan Dian Desa in Yogyakarta, Indonesia. Main focus of the project was placed on small-scale decentralised composting operated by a community-based primary waste collection service. The objectives of the project were to encourage low-income urban

communities to manage their own waste collection, to integrate resource recovery and recycling into their collection scheme, and also to gain experience with such systems for replication in other communities.

2.0 PILOT PROJECT YOGYAKARTA, INDONESIA

2.1 The Community of Minomartani and its Primary Collection

The overall responsibility for Yogyakarta's solid waste management lies with the Municipal Cleansing Department, which currently manages around 68 % of the generated waste (Pfammatter & Schertenleib 1996). The Municipal Cleansing Department has delegated the management and responsibility of the primary waste collection to the administrative departments of the community. To assist this organisational structure, the Cleansing Department supplies primary collection carts, sets up transfer stations and assures a reliable secondary collection. Prerequisite for the selection of the pilot project area was a well-established community-based primary collection scheme, enough organic waste to be processed, and an active interest of the community leaders and waste collectors in participating in the scheme. The community of "Perumahan Minomartani" was selected on the basis of these prerequisites. This community area comprises 1,600 households with a total population of 7,800. The area is divided administratively into 6 community units (RW), which are in turn subdivided into five or six neighborhood units (RT), each amounting to a total of 30 RTs. In the Minomartani area, four of the six RWs have combined their efforts to establish and manage a joint community-based primary waste collection unit, the "Minomartani Garbage Management Unit (UPSM)". Eleven waste collectors are employed by this waste management unit and are supplied with handcarts for the daily waste collection service (Figure III.1, A). Depending on the income of the households, each serviced household pays a monthly fee of Rp. 500-1500 (0.07-0.20 US$). Furthermore, each neighborhood unit pays the Municipal Cleansing Department Rp. 9000/month (1.22 US$) for the secondary collection service (collection and transport from transfer point to landfill).

2.2 Composting Site Characteristics

After holding a formal meeting with the local leaders of the community units and the Garbage Management Unit (UPSM) representatives, the concept of a composting unit linked to the primary collection scheme was finalised and first

steps were taken to select an appropriate site. Finding space for composting activities was not easy as the area is densely populated. Following numerous discussions and negotiations, an ideal site was found adjacent to the intermediate dumping site (transfer point) and near the river, thereby, allowing free water access. The 300 m^2 plot was rented for the first two years and 200 m^2 were levelled out, sealed with a concrete floor and covered by a simple zinc roof structure without walls.

Figure III.1 A illustrates household waste collection by handcarts. B Waste sorting. C A composting heap with its bamboo tunnel for aeration. D Turning the compost pile.

Construction of the composting unit took one month and was completed solely by the six waste collectors who decided to participate in the composting project at an earlier stage of the scheme.

2.3 Composting Operation

The waste delivered at the unit mainly originates from households (~ 60 %) and partly from a university complex (~ 40 %). The household waste is collected on a daily basis by handcarts. The mean transport distance from the households to the composting unit, located on the outskirts of the community area, amounts to one kilometre. Waste from the university complex is collected twice a week by a small truck. The amount of raw waste processed at the composting unit of Minomartani averages 2.4 tons per day (April 1999). The raw waste is first sorted manually into organic and inorganic fractions as well as into recyclable which can be directly resold (Figure III.1, B). The inorganic, non-recyclable fraction is transported to the nearby transfer point from where it is collected and transported to the municipal landfill by the Public Cleansing Department. The organic fraction is subsequently piled around a bamboo triangle tunnel, which serves to aerate the compost pile (Figure III.1, C). This composting technique was tested in Jakarta between 1989 and 1992 by the Center for Policy and Implementation Studies (CPIS) jointly with consultants from the Harvard Institute for International Development (HIID) (CPIS, 1993). Based on the results of the study, the composting unit of Minomartani started a similar composting system which was developed further during the project. A total of three piles a week are heaped with two days of organic waste per pile. The temperature of the piles is monitored on a daily basis during the first four weeks. Temperature logs have shown that the piles should be turned on a weekly basis (Figure III.1, D). Moisture content is determined by a simple manual method during the turning process (Figure III.2), and the pile is watered if necessary with a watering can. Non-degradable material is periodically removed during the turning process. In the fourth week, the compost is left to mature for an additional month, after which it is screened and bagged for sale. The screened organic residues are returned to the fresh compost pile.

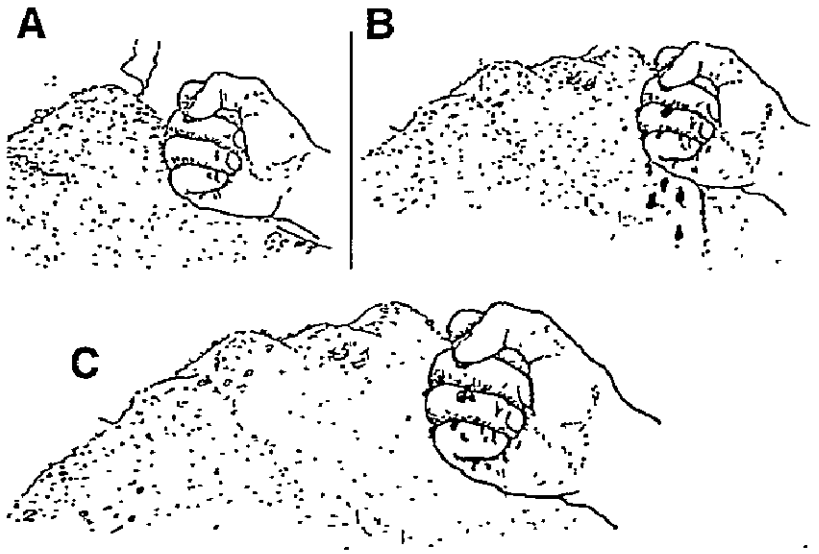

Figure III.2 The simple moisture test consists in hand-squeezing the compost. A) If no water is squeezed out, the compost is too dry. B) If many drops can be squeezed out, the compost is too wet. C) If a few drops can be squeezed out, the moisture content is ideal. (CPIS 1992)

After working on the unit for a month, the waste collectors were trained in the composting principles and steps, in processing the final product and in quality control to perfect their skills and knowledge. To improve labor efficiency, a time and motion study was also conducted after the first two months of operation.

3.0 RESULTS AND DISCUSSION

3.1 Technical Aspects

From a technical perspective, the composting unit can be regarded as successful. Unwanted by-products like odor, leachate and fly breeding were avoided through a periodic monitoring program with planned response actions and well-trained and motivated staff. The compost produced is of good quality, as the total nitrogen value amounts to 0.75 % (dry weight basis) and the C/N ratio to 19.

The system of piles with passive aeration tunnels work well. However, as no parallel tests were conducted without tunnels, it is difficult to say how far the ventilation tunnels contribute to the composting process. In the late thermophilic phase (after 3 weeks) and in the following mesophilic phase, the bamboo tunnels are omitted. No significant changes were observed as regards the duration of the process.

A time and motion study revealed that sorting is the most time-consuming activity (Table III.2). However, compost quality will most likely suffer if sorting time is decreased. To this day, sorting efficiency has not been increased yet. To increase efficiency during screening, a simple crusher powered by a diesel motor was developed and used to crush the compost prior to screening. This mechanical system was, however, not very successful as it could hardly handle the moist compost and was, therefore, frequently out of order.

3.2 Social, Organisational and Financial Aspects

During project start-up; the unit comprised 6 waste collectors in charge of composting. Meanwhile, 15 people from the serviced community are employed at the composting unit. They all hold a respected position within the community. From an organisational perspective, 6 senior workers supervise the unit and also train new or temporary workers from other composting sites. The total workload based on weekly man-hours is summarised in Table III.2.

Table III.2 Weekly workload, categorised by type of composting work at the site (based on day compost production)

Activity	Man-hours / week	% of total
Collection	96	13 %
Sorting	336	46 %
Compost piling, turning and watering	168	23 %
Screening	84	12 %
Bagging	42	6 %

Revenues from the sale of compost to Dian Desa (local NGO), who is also responsible for marketing the product, are 450 Rp./kg (0.06 US$).

3.3 Future Outlook

The pilot project of Minomartani has attracted the attention of numerous representatives from universities, non-governmental organisations (NGO) and government institutions who visited the composting unit. The local government has shown a keen interest in replicating the system in other communities. During the last half year two units have been initiated, one is operational and the other is currently being built. Yayasan Dian Desa and the team leader of the composting

unit of Minomartani were asked to act as technical advisors for these units and employees of these new units are being trained on the pilot project site.

However, marketing of compost is still rather difficult due to lack of demand for this product and inability of the retail market to cope with the increasing supply of compost. Since such composting units are replicated in other communities, the problems are likely to intensify in the near future. Marketing of the product at a cost-covering price also proves difficult on account of the current economic crisis in Indonesia, compelling the inhabitants to increasingly focus on satisfying their basic needs. The future activities planned to enhance market demand include formulation of recommendations for agricultural use and establishment of an agricultural demonstration plot for awareness building campaigns. The demand for compost might also be enhanced given the governments current policy of reducing subsidies on mineral fertilisers.

It is, however, also vital for municipal governments to become aware of the cost-saving factor of such composting schemes, as transport and volume of waste to be disposed of are significantly reduced. Studies to determine the effective cost-saving of composting impacts on municipal waste management expenditures is something to be pursued further. It is important for future composting projects to involve and be assisted by the responsible government agencies at an early stage. Furthermore, the composting units should not be regarded as a community whim by the municipality, but as an integral part of the solid waste management system.

4.0 CONCLUSION

Composting municipal solid waste combined with a primary collection scheme has potential in any urban solid waste management system. The main factor influencing financial sustainability of composting units is the market demand for the compost product. Combining waste collection with composting activities can strengthen the financial viability of the scheme, as the revenues from collection of fees and recyclable materials can help cover composting operation and marketing costs, thereby allowing a more competitive compost pricing policy.

With regard to unsuccessful centralised systems of the past, the comparative advantages of decentralised composting can be summarised as follows:

- Composting near the waste source reduces additional transport costs.
- Small-scale composting technology can be based on manual labor, keeping capital and maintenance costs low.

- Collection and composting on community level strengthens the communities, decreases dependence on municipal waste management services, enhances responsibility and community interaction, and raises health and environmental awareness.
- Composting in the community allows the end product to remain close to its potential buyers for use in urban agriculture, and to minimise transport and marketing costs.

Seen from a broader economic perspective, decentralised composting significantly reduces municipal solid waste management costs, creates employment in the communities, raises environmental awareness, and is a step towards sustainable urban management. However, until now, detailed studies of decentralised composting's economic and financial benefits for the municipal authorities and for the city's population is still lacking. This should be one focal point of future research, as quantitative data is one of the main needs of decision-makers when evaluating composting as an option in their city's solid waste management system.

REFERENCES

Alter Ego, CREPA, IAGU, SANDEC (1996). "Valorization Des déchets organiques Dans Les quartiers populaires des villes africaines. (Giving value to organic wastes in low-income areas of African towns)", Project FNRS No. 5001-038104, Module 7, Développement et Environnement, Program Prioritaire Environnement, Fonds National Suisse de la Recherche Scientifique. 143 pp. Swiss Center for Development Cooperation in Technology and Management, SKAT, St. Gallen, Switzerland.

CPIS (1992). "Panduan Praktis Pembuatan Kompos (Practical Handbook on Composting)", Center for Policy and Implementation Studies (CPIS) and Harvard Institute for International Development (HIID), Jakarta, Indonesia.

CPIS (1993). "Enterprises for the Recycling and Composting of Municipal Solid Waste", Volume 1, Conceptual Framework. Center for Policy and Implementation Studies (CPIS) and Harvard Institute for International Development (HIID), Jakarta, Indonesia.

Pfammatter R., Schertenleib, R. (1996). "Non-Governmental Refuse Collection in Low-Income Urban Areas", Lessons Learned from Selected Schemes in Asia, Africa and Latin America. 70 pp. *SANDEC Report No. 1/96*. Water and Sanitation in Developing Countries EAWAG/SANDEC, Duebendorf, Switzerland.

COMMUNITY BASED DECENTRALIZED COMPOSTING: EXPERIENCE OF WASTE CONCERN IN DHAKA

by

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1.0 BACKGROUND

Dhaka, the capital of Bangladesh, is one of the fastest growing metropolises of the world with an annual average growth rate of 6.6 per cent. The population of this megacity with an area of 1353 sq. km. is estimated at 10.41 million (1999), while that of Dhaka City Corporation (DCC) is estimated at 6 million in an area of 344 sq. km. These six million residents generate about 3000 metric tons of municipal solid waste per day. The City Corporation is responsible for management of this enormous quantity of solid waste, only 42% of which is collected every day. The rest lies on roadsides, open drains and low-lying areas, thus contributing to the deteriorating quality of the city's environment (Enayetullah, 1995).

There is, however, a gradual recognition of waste as a resource. In an attempt to recover the value from organic waste, Waste Concern, a research based non-governmental organization, initiated a pilot project in 1995 for community based decentralized composting integrated with primary collection of solid waste. Waste Concern's decentralized composting project in Dhaka, was established with two principal observations. First, like many other cities of the developing world, more than fifty per cent of the waste generated in Dhaka is disposed in environmentally unsound and unfriendly manner. Second, a large informal sector industry exists in

Dhaka that recovers and recycles solid waste. The existence of this recycling industry demonstrates that waste has some value.

Fifteen per cent of the recyclable waste is collected from the total generated solid wastes by 87,000 people in the informal sector (Sinha, 1993). At the bottom of this informal sector recycling activity is a small brigade of scavengers, popularly known as *Tokais* in Dhaka, who search for recyclable materials in the waste stream. They mainly collect reusable and recyclable materials. These materials are transported and sold to entrepreneurs throughout the city who arrange for the materials to be sorted, cleaned and then sold through a marketing chain that ends at several types of recycling factories. Although *Tokais* extract most of the readily available inorganic recyclable from the waste stream, there appears to be considerable value in what they leave behind. This value lies in the organic (biodegradable) portion of the waste, which can be converted into compost-an organic fertilizer that improves the ability of soil to retain water and resists soil erosion. Presence of high percentage of organic matter in the waste suggests that composting provides a viable option of waste disposal.

Table III.3 represents the physical composition of solid waste from different areas of Dhaka city. It may be seen from the table that a major portion (70% to 80%) of the solid waste in the mixed, residential and commercial areas of Dhaka city is organic (food & vegetable waste, garden waste, tree trimmings and straw). The large quantity of organic contents present in the Dhaka's waste composition indicates the necessity for frequent collection and removal. This also indicates the potential of recycling of organic waste into compost. There is also a good market for the compost, as majority of the land use in Greater Dhaka and its adjoining areas is agricultural.

Table III.3 Comparative Results of Composition of Solid Waste of Dhaka City Corporation Area

Component	Mixed Waste (%) by wt	Residential waste (%) by wt	Commercial waste (%) by wt	Industrial waste (%) by wt
Food and Vegetable Waste	70.12	59.91	62.05	26.37
Paper Products	4.29	11.21	6.28	7.59
Plastic, Rubber and Leather	4.71	17.67	4.62	6.01

Component	Mixed Waste (%) by wt	Residential waste (%) by wt	Commercial waste (%) by wt	Industrial waste (%) by wt
Metals	0.13	0.15	0.28	-
Glass and Ceramics	0.25		0.37	-
Wood	0.16			-
Garden Wastes, Tree Trimmings and Straw	10.76	8.76	2.86	4.32
Cloths	4.57		18.93	46.2
Rocks, Dirt and Misc.	5.01	2.30	4.62	9.49
Moisture Content (%)	65	50	54	60

Source: GOB and World Bank, 1998

2.0 WHY DECENTRALIZED COMPOSTING?

The existing physical plan and socio-economic situation of Dhaka strongly suggests decentralization of the composting system. Some of the reasons are:

- Decentralized composting system is labor intensive and less costly compared to the centralized one.
- It is well-suited for our waste stream, climate, social and economic conditions.
- Low cost easily available local materials and low cost technology can be used in this technique.
- Improves community participation in source-separation and reduces the volume of solid waste at the source more effectively.
- A significant improvement can be achieved in the collection of solid waste.
- It reduces the cost incurred for collection, transportation and disposal of waste by municipal authorities.
- Enhances income and job opportunity for the poor, socially deprived informal workers and small entrepreneurs.

3.0 THE PROJECT: COMMUNITY BASED DECENTRALIZED COMPOSTING

In an attempt to recover value from the organic portion of the waste, *Waste Concern*, for the first time initiated a Community Based Decentralized Composting Project in Section-2, Mirpur, of Dhaka. A small piece of vacant land measuring 1000 sq. meter within Section-2 of Mirpur Housing Estate was made available to

Waste Concern by the Lions' Club (Dhaka North) for the composting plant. The Lions' Club initially allowed a three-month period to observe Waste Concern's performance. Since 1995, the plant is in full operation and the support of the Lions' Club has continued. The prime goal of this demonstration project was to explore the technical and commercial feasibility of the labor-intensive aerobic composting technique in Bangladesh. In future, *Waste Concern* has plans to replicate the pilot project in phases in all the towns and cities of the country.

3.1 Community Mobilization for Waste Collection

Waste Concern gave special attention to assessment of the need and aspiration of the beneficiaries and on community involvement in the project. With this objective in mind, before initiating the project, *Waste Concern,* with the help of Environmental Task Force of the Goethe Institute, Dhaka conducted a questionnaire survey amongst the residents of Section-2, Mirpur Housing Estate to determine their opinion on solid waste management, willingness to participate in any improvement program and also their willingness to contribute. The results from the questionnaire survey provided the basis for the project. The survey findings revealed that more than 80% of the residents of the locality were not satisfied with the existing solid waste management service of the Dhaka City Corporation (DCC). Most respondents supported the idea of an alternative door-to-door solid waste collection scheme. In addition, when the respondents were asked about their willingness to pay a service charge for house to house waste collection, 77% of the surveyed households were willing to pay between Tk.15-60 per month to any organization for the additional service. These findings encouraged *Waste Concern* to initiate the project. However, 23% of the households were of the opinion that as they are paying conservancy tax to the Dhaka City Corporation they declined to pay again for the door-to-door waste collection.

In addition to community mobilization, *Waste Concern* has also been working to build awareness among the city-dwellers regarding source separation, recycling and resource recovery of solid waste. *Waste Concern* has developed posters and training manuals for building awareness. In order to increase awareness, *Waste Concern* has established links with the Residents Association of the neighborhood.

3.2 Identification of Potential Users of Compost

Before starting the project, a detailed survey of the farmers (potential users of compost) was also conducted by *Waste Concern* in 1995. It was found from the survey that there is a good demand for compost in Dhaka and adjoining areas. It was revealed from the survey that 94% of the farmers in Savar, Hemayatpur was interested in buying compost. It was alarming to note from the survey that present yield per *bigha* was less than what it was 10 years ago; 78% of the farmers surveyed opined that soil fertility decrease in recent years was due to excessive use of chemical fertilizer and lack of use of organic manure (DOE, 1990; Bangladesh Observer, 1994 a, b). Most respondents (84.6%) stated that they were not using the organic manure simply because it was unavailable.

According to a recent study of Bangladesh Agriculture Research Council, NPK (Nitrogen, Phosphorus, and Potassium) in soil is depleting quite rapidly. The content of organic matter in the soil is now estimated at less than one per cent whereas the critical level is 3 per cent (Gain *et.al.* 1998, p.52). The soil has become hard as a result. Lack of use and availability of organic manure is mainly due to large use of agricultural residues and animal dung in the rural areas as fuel. In rural areas 98.69% of the households use cowdung, husk and wood as fuel (BBS, 1993). Application of compost in land improves the quality of soil, making it more productive. Moreover, compost has a buffer effect as protection against large application of chemical fertilizers.

3.3 Collection of Solid Waste

A door-to-door solid waste collection system was introduced by *Waste Concern* to collect the domestic organic waste (free from toxic and clinical wastes) in the project area. At present, *Waste Concern* collects 2 tons of solid waste per day. Modified rickshaw vans are used for collection. Before obtaining source-separated waste from the households, solid waste from the restaurants and vegetable markets were collected. Initially, 100 households of the area participated in the program. After four years of operation, 1000 households of Section-2 of Mirpur Housing Estate are participating in the waste collection scheme. Out of these 1000 households, 700 households are participating in the door-to-door collection program of *Waste Concern* and 300 households are participating in the door-to-door collection program run by another CBO. The door-to-door solid waste collection scheme of *Waste Concern* has a demonstration effect as well. After four

years, adjoining neighborhoods have also started door-to-door solid waste collection schemes and formed CBOs. *Waste Concern* plans to expand its waste collection activities to 1000 households and has also launched environmental awareness program with the help of the community.

For door-to-door waste collection the households pay a monthly charge of Tk.15 per household. Initially the households were paying monthly charge of Tk. 10 per month, and subsequently Tk. 15 per month as the households appreciated the benefits and service. Income from solid waste collection service is spent on the wages of the part time van drivers and waste collectors. The door-to-door waste collection system is thus self-sustaining. *Waste Concern* is planning to tag other CBOs working in the adjoining neighborhoods to bring their collected solid waste to the recycling and resource recovery plant. Recently, the waste processing capacity of *Waste Concern's* plant has been expanded to 3 tons/day with assistance from Regional Urban Development Office (RUDO), South Asia, USAID.

3.4 Composting Technique

Composting is not a new activity in Bangladesh. However, traditional rural techniques are not suitable for a megacity like Dhaka, where large amount of waste are generated daily in densely populated areas, with little space for processing. Composting of municipal solid waste using capital intensive mechanized plants has not been found cost-effective in developing countries. Thus, it became necessary that for successful composting of municipal solid waste in Dhaka, an appropriate low-cost technique be developed and experimented in the urban setting. With this end in view, *Waste Concern's* pilot demonstration plant was established in January 1995. Its purpose was to develop a composting technique that was:

- Less capital intensive;
- Located near urban residential areas;
- Caused minimum nuisance from odors and flies;
- Produced an environmentally safe product; and
- Well-suited to Dhaka's waste stream, climate and socio-economic condition.

Two composting techniques were tested by *Waste Concern* in its pilot project for decentralized composting schemes. These are Chinese Covered Pile System and Indonesian Windrow Technique. From a field experimentation, it was found that

the Chinese Covered Pile System was not appropriate for community based projects due to odor problem. In larger dumpsites, Chinese Covered Pile System may be a viable option for composting. However, Indonesian Windrow Technique has some odor when the windrows are turned, which is tolerable. Regarding the nutrient concentration of compost, Indonesian Windrow Technique exhibited better results (Table III.4).

Table III.4 Comparative Analysis of Nutrient Concentration by Two Composting Methods

Composting Method	p^H	Nitrogen (%)	Phosphorous (%)	Potassium (%)	Sulpher (%)
Aerobic (Indonesian)	7.6	1.64	0.96	1.6	0.45
Chinese	7.6	1.44	0.89	1.4	0.45

The aerobic composting of Indonesian Windrow Technique has been adopted by *Waste Concern*. The collected solid waste is separated and sorted in the resource recovery (composting) plant located within the community. Compostable organic waste is heaped into piles (under a covered shed made with steel angle posts and asbestos roofing on top), which allows the beneficial microorganisms to decompose the organic waste efficiently. In addition, the shed protects the compost worker from rain and heat of the sun. Pile temperature of 55-65 degree celsius is optimum for aerobic composting. To enable the micro-organisms to obtain sufficient oxygen, the pile is aerated using bamboo aerators. In tropical countries, the piles are liable to reach excessively high temperature. Turning over the pile along with use of bamboo aerators is the method used to maintain pile temperature. Turning associated with watering facilitates rapid decomposition and also moves the non-decomposable materials from exterior of the pile into the interior, thus providing new food source for the bacteria. Temperature of the pile determines when to turn. The temperature is monitored and records are kept of the temperature trends. Carbon: Nitrogen ratio of 35 to 50 is optimum for aerobic composting. The Carbon: Nitrogen ratio of solid waste is slightly higher (carbon 22.6% and nitrogen 0.41%) in Dhaka. At higher Carbon: Nitrogen ratios, nitrogen may be limiting nutrient. In this project *Waste Concern* uses chicken and cattle manure to optimize the nitrogen content and also to overcome the deficiency. Sawdust is also mixed with the waste to increase air spaces, enabling proper aeration and reducing bulk weight of the compost mixture. The process of composting has very little odor.

The composting process requires 40 days for decomposition and another 15 days for maturing. After maturing the compost is screened for different grades and packed for marketing. Recently, *Waste Concern* is trying to reduce the decomposition time of 40 days by using innoculums (compost digester) to accelerate decomposition. At present, 500 kg of compost is produced every day by processing two tons of solid waste. Six female workers of the informal sector are working in the composting plant.

In this plant, areas are demarcated for waste delivery and residual removal, active composting, maturing, screening and bagging area, a store room for bagged compost, facilities for storage of equipment and personal items of workers and an office. In addition to these facilities separate space is earmarked for demonstration organic farming. Generally, 50% to 60% of the total site area is used for compost piles, approximately 15% for sorting and residue removal, another 15% for screening and bagging of compost and approximately 15% for storage and office facilities.

3.5 Marketing of Compost

There is a good market for compost around Dhaka. *Waste Concern* sells its compost to a number of outlets like fertilizer marketing companies and nurseries. *Waste Concern* is at present selling its compost at a price ranging from Tk. 2.5 to Tk. 5.0 per kg. The quality of compost is monitored in the laboratories of Soil Science Department of Dhaka University. The following table shows comparative nutrient concentration of compost available in the international market and that produced by *Waste Concern* in Dhaka. The table indicates that compost produced by *Waste Concern* has good NPK value.

Table III.5 Comparative Analysis of Nutrient Concentration in Solid Waste Compost

Nutrient Concentration (values in %, except pH)	Compost Produced		
	By Original Indonesian Technique	In International Market	By Waste Concern
Nitrogen (N)	1.4	1.1	1.64
Phosphorous (P)	0.36	0.4	0.96
Potassium (K)	0.66	0.50	1.6
p^H	7.8	7.5	7.6

Waste Concern is now trying to promote the sale of nutrient enriched composts (compost blended with chemical fertilizer). Ministry of Agriculture of Government of Bangladesh has approved six brands of enriched compost specifically for rice, wheat, potato, vegetable, tobacco, and tea.

3.6 Financial Feasibility of the Project

Three broad issues need to be investigated for economic analysis of the community based decentralized composting. *First,* what is the cost of extracting recyclable materials from Dhaka's municipal solid waste that is left over by the *Tokais*? This issue deals with matters relating to supply side of composting, using the decentralized approach. *Second,* how much compost can be sold in the market at prices that cover the production costs and provide a normal rate of profit? This deals with the demand side of compost. *Finally*, what is the intangible benefits (i.e. social effects above and beyond private cost and benefits)? The main questions here are, in what ways and by how much does decentralized composting reduce the cost of managing municipal solid waste in Dhaka.

Production of compost involves two types of costs-fixed cost involved in composting plant and operational cost of running the plant. Table III.6 shows the fixed cost involved in a three-ton capacity composting plant, at present processing two tons of waste per day.

Table III.6 Fixed Cost Involved in Three-Ton Capacity Compost Plant

Item	Taka	US $
Construction of composting shed with drainage facility of 2235 sq.ft @Tk.120/sq.ft	2,68,200	5,364
Construction cost of sorting platform with shed of 375 sq.ft @ 120/sq.ft	45,000	900
Construction cost of office and toilet facility of 100 sq.ft @ 500/sq.ft	50,000	1,000
Purchase of 3 rickshaw vans @ Tk. 15,000/each	45,000	900
Water and electricity connection	50,000	1,000
Equipments for composting, dress for workers	50,000	1,000
Total Fixed Cost	**5,08,200**	**10,164**

Note: 1 US $ = Tk. 50

Table III.7 Operational Cost (per year)

Item	Taka	US $
Salary of 6 (six) workers @ Tk.1000/month	72,000	1,440
Salary of 2 (two) van drivers @ Tk.1500/month	36,000	720
Salary of 4 (four) waste collectors @ Tk.500/month	24,000	480
Salary of plant manager @ Tk.5000/month	60,000	1,200
Electricity and water bill	5,000	100
Raw material for compost	12,000	240
Total Operational Cost	**2,09,000**	**4,180**

Note: 1 US $ = Tk. 50

Table III.7 illustrates operational cost involved in such plants. Of the total cost involved in the production, 62 per cent is labor cost, considering the plant life of 5 years. In terms of labor cost Tk. 60,000 is involved in collection of solid waste, i.e., for raw material for composting. However, this cost is fully recovered from the contribution received from the households for the service provided which amounts to Tk.1,26, 000 (Table III.8). Moreover, an extra amount of Tk 66,000 is earned from door-to-door solid waste collection system. In this cost analysis, land value or rent is not included. Land is quite expensive in Dhaka, which is one of the most densely populated cities in the world. Fixed capital is assumed to have a life of 5 years.

Table III.8 shows the earning made from the decentralized composting. It may be observed from Table III.7 and Table III.8 that the net earning from the decentralized system is Tk.3,17,000 per year.

Table III.8 Earnings (per year) from the Composting Plant

Item	Taka	US $
Sale of compost 500 kg from processing 2 tons of solid waste per day for 320 days @ Tk. 2.5 / kg	4,00,000	8,000
Charge for house to house waste collection service rendered @ Tk. 15/-household from 700 households	1,26,000	2,520
Total Earnings	**5,26,000**	**10,520**

Note: 1 US $ = Tk. 50

Commercial appraisal of the project, i.e., return on investment shows that the project is viable as the net present value (NPV) of the project at 16% discount factor is positive amounting Tk. 456,682.

3.7 Other Benefits from the Project

Apart from the financial benefit, there are a number of other advantages of decentralized composting, as proven by the 3-ton Mirpur plant. These may be enumerated as:

- Decrease in waste management cost by reducing huge volume of the solid waste. It is estimated that a small 3 ton capacity community based compost plant can save Dhaka City Corporation Tk.8, 97,900 (US $17,958) per year [*Based on average per ton solid waste management cost (i.e., cost involved to collect, transport and dispose waste) of Tk.820 per ton].*
- A small 3 (three) ton capacity compost plant can save 1095 sq. meter landfill area per year.
- Improvement in overall environment of the neighborhood by checking illegal disposal of waste on roads, drains or vacant lots as solid waste is directly collected from the households.
- Decentralized community based composting plants can generate employment for the poor especially the women, and offers new prospects for small entrepreneurs to take part in the recycling business.
- Returns organic matter in the soil and minimizes the use of chemical fertilizers.

4.0 CONCLUSION AND FUTURE PROSPECTS

The experience of *Waste Concern* in decentralized composting in the city of Dhaka is quite promising and encouraging. The results generated from the five years of operation of the pilot project support the hypothesis that small-scale composting is commercially profitable, mainly because the method adopted in the composting produces high quality compost from raw waste in about 40 days including maturing time. Using this method, compost can be produced at an average cost of Tk.1.77 (US $0.035) per kg, an amount substantially lower than the price at which organic manure is typically sold in Dhaka. In Dhaka, organic manure is at present being sold between Tk. 10 to Tk.15 per kg in the nurseries. However, to promote the product, *Waste Concern* is selling the compost produced at a price of Tk 2.50 per kg for bulk buyers and Tk. 5 per kg to potted plant growers and nurseries.

4.1 Lessons Learnt

The following conclusion and lessons can be drawn from the pilot project of *Waste Concern*:

- *The success of a community based program depends largely on identifying and addressing the communities' needs while sustainability of the project depends on involving them in the cost-recovery/cost-sharing process.* Charges for the service provided should be minimum during the initial stage of the project and after demonstrating the " before and after effect" it may be increased. People do not object to pay higher service charge once they see tangible improvements. *Waste Concern* during the first year of the project charged Tk. 10 for house-to-house waste collection and after one year, increased it to Tk. 15. The community didn't oppose the increase, as the beneficial effect of the project was appreciated by the beneficiaries.
- *Community based projects have demonstration effects.* In case of Mirpur project, initially 100 households participated and after few years 1000 households, i.e., 6,000 people are participating in the project. Moreover, after observing the project, adjoining neighborhoods have organized house-to- house solid waste collection and formed CBOs.
- *NGOs can play an important role in initiating and demonstrating new concepts and providing technical know-how and training to others.* The idea of community based composting plant was a new concept in Dhaka and *Waste Concern* had to cross many hurdles to initiate it. Before starting the Mirpur project, the founders of *Waste Concern* approached Dhaka City Corporation for initiating the community based composting project and were willing to provide free technical service, but all efforts went in vain. Even initially Lions Club was skeptical as they were afraid of the odor problem and giving land for waste recovery plant might create resistance from the local community. *Waste Concern* gave several presentations explaining the project activity and at last managed to convince the Lions Club. They gave the land to *Waste Concern* initially for three months, on condition that in case of odor problem in the area they would withdraw the permission and since then the project is in full operation without any problem. Now this project has become a demonstration project for local entrepreneurs and municipalities.
- *Small-scale compost plant can be located within the community provided appropriate scientific composting method is followed.* Special attention should be given to avoid odor problem and maintaining aerobic condition

throughout the composting process. Aerobic windrow technique should be followed under covered shed because in open, during rainy season it will create smell problem. *Waste Concern* first experimented with Chinese Covered Pile system of composting and found that it creates odor problem, which raised objection from the community. Although Chinese covered pile system is less expensive than aerobic windrow technique, it is not feasible at community level due to odor problem.

- *Decentralized compost plant is commercially viable as seen from the Mirpur experience.* Two operations, primary collection and composting should be integrated to make it a viable micro-enterprise. This type of micro-enterprise can be replicated through demonstration, training and technical support. Many entrepreneurs are approaching *Waste Concern* for technical assistance and training.
- *It has been found that women from informal sector are interested to work in the composting plant, and it is socially acceptable.* It was generally believed that only 'sweepers community' works with waste. However, it has been found that most of the female workers working in the plant previously worked in garment factories and as domestic help, which has long working hour. In *Waste Concern's* plant they have to work for eight hours a day with a weekly holiday.
- *Marketing of compost is a major problem.* This problem can be overcome by involving the private specialized fertilizer marketing companies. Compost enriched with nutrients is easily marketable in rural areas rather than raw compost. *Waste Concern's* experience shows that the fertilizer companies purchase compost in bulk, mix it with nutrient to make it more attractive to farmers. Media can play a vital role in popularizing compost. Press has played a positive role in disseminating the project activity in Bangladesh. Apart from media, Government has to make necessary policy conducive to marketing of compost.

Despite the achievements of *Waste Concern*, however, the program has been slow to expand. Replication of the concept in other communities, city corporations and municipalities has been rather difficult. At the national level, in Bangladesh, there is no policy on solid waste management for the city corporations and municipalities.

4.2 Support Required for Scaling-up

Based on the experience gathered so far by the pilot project of *Waste Concern*, it appears that this type of micro-enterprise can be replicated in Dhaka and elsewhere

in Bangladesh as well as in other Asian countries. Realization of full potential of this kind of project, however, can only be achieved if the government or municipal authorities provide the following types of support:

- Land should be provided free of cost or at a nominal rate to the entrepreneurs or community groups interested to run the project.
- Arrangement of loan facilities to start the project.
- Training and technical Advice.
- Assistance in marketing of compost.
- *Waste Concern's* experience shows that the enrichment of compost with necessary nutrients can make it more attractive, affordable and effective to the farmers for better crop yield and sustainable soil.

4.3 Future Prospects

There are several trends and developments that make *Waste Concern* optimistic about the future progress. The most important and long-term benefit from *Waste Concern's* pilot project is the growing awareness, which has made a significant contribution to the national and local debate on solid waste management. For the first time in Bangladesh, urban organic waste is being recovered in an economically sustainable and viable manner; also the project has generated considerable interest in the country. Almost all the national dailies in Bangladesh have published special feature on the pilot-composting project of *Waste Concern*, which has raised public awareness. Several hundred representatives from government authorities, external support agencies, universities, private sector, journalists, foreign delegates have visited the site since it opened in 1995. Some of them are beginning to question the traditional assumption that waste management should be centralized as the sole responsibility of local authorities. Others are beginning to appreciate that most of the urban waste in Bangladesh can be utilized positively with economic and environmental benefits.

4.4 Replication of the Project by Government and Municipal Authorities

Recently, the Ministry of Environment and Forest (MoEF) of Government of Bangladesh with support from UNDP, under its Sustainable Environment

Management Program (SEMP) has initiated replication of the decentralized composting project integrated with door-to-door solid waste collection program in 5 (five) communities of the DCC area. Moreover, water and sanitation program and Swiss Development and Cooperation are replicating the project in Khulna, the third largest city of the country. Dhaka City Corporation (DCC) has recently provided land to *Waste Concern* for establishing a community based composting plant. Public Works Department (PWD) of Government of Bangladesh has also provided public land in six government residential colonies in Dhaka for the same purpose. It is now believed that as the awareness grows, government policy and the market forces will be interested in realizing the huge potential of composting throughout Bangladesh.

REFERENCES

Amin, A. T. M. (1991). "Guidelines for Effective Utilization of the Informal Sector in Urban Waste Management," a paper prepared for the Division of Industry, Human Settlements and Environment, UN-ESCAP, Bangkok, Thailand.

Bangladesh Observer (1994a). "Excessive Use of Soil Decrease Fertility," February 2.

Bangladesh Observer (1994b). "Natural versus Artificial Fertilizer," February 14.

Bangladesh Bureau of Statistics BBS (1993). "Statistical Pocket Book of Bangladesh," Statistical Division, Ministry of Planning, Dhaka.

Center for Policy Implementation (CPI) (1993). "Enterprise for the Recycling and Composting of Municipal Solid Waste," Jakarta, Indonesia.

Department of Environment (DOE) (1992). "Environment of Bangladesh and Department of Environment," a report published by DOE, Ministry of Environment & Forests.

Enayetullah, I. (1995). "A Study of Solid Waste Management for Environmental Improvement of Dhaka City," an unpublished Master of Urban & Regional Planning Thesis, Department of Urban and Regional Planning, Bangladesh University of Engineering and Technology (BUET), Dhaka.

Gain, P. (1998). "Bangladesh Environment: Facing the 21st Century," SHED, Dhaka.

Government of Bangladesh (GoB), World Bank (1998). "Refuse Quality Assessment of Dhaka City Corporation Waste to Electrical Energy Project," a report prepared by Institute of Fuel Research and Development, Bangladesh Council of Scientific and Industrial Research.

Sinha, A.H. M.M. (1993). "The Formal and Informal Sector Linkages in Waste Recycling: A Case of Solid Waste Management in Dhaka City," an unpublished MSc. Thesis, Human Settlement, Asian Institute Technology (AIT), Bangkok, Thailand.

BARREL TYPE COMPOSTING FOR SLUMS: EXPERIENCE OF WASTE CONCERN IN DHAKA

by
Iftekhar Enayetullah
and
A. H. Md. Maqsood Sinha

1.0 BACKGROUND

The population of Dhaka has risen significantly during recent years. Different studies have shown that rapid growth of Dhaka's population is caused by large influx of rural-urban migration. Findings from different studies also conclude that most of the rural migrants are driven to Dhaka due to poverty. The deplorable condition of these poor migrants and acute shortage of adequate housing has led to mushroom growth of slums and squatter settlements in Dhaka. A recent study by the Center for Urban Studies (CUS) estimates that nearly one-third of Dhaka's population, i.e., 3 million live in slums and squatter settlements. Municipal services are already overburdened, and simply cannot provide services to the slum dwellers, leaving the residents to their own devices for sanitation and other basic services, resulting in unhygienic and filthy living conditions.

2.0 THE PROJECT: BARREL TYPE COMPOSTING FOR SLUMS

In an attempt to search for an alternative low-cost and sustainable solid waste management facility for slums, *Waste Concern*, for the first time in Dhaka, initiated a pilot barrel type composting project in two slums, with support from UNDP's Local Initiative Facility for Environment (LIFE) Program. Shah Ali Bagh slum located in Mirpur area of Dhaka city with 120 households was selected as the first

pilot intervention area. This project is in operation since November 1998. From September 1999, *Waste Concern* is replicating the project in Kolwala Para, another slum in Mirpur area of Dhaka city consisting of 130 households. Both projects aim to bring sustainable solid waste management service with economic benefits within reach of the slum dwellers. In future, *Waste Concern* plans to replicate the project in phases in other slums of Dhaka city. This composting method is based on Sri Lankan model, which is being successfully implemented in Colombo.

3.0 COMMUNITY MOBILIZATION AND AWARENESS RAISING

Waste Concern gave special attention to assessment of the need and aspiration of the beneficiaries and also on community involvement in the project. With these objectives in mind, before initiating the project, a questionnaire survey was conducted amongst the slum dwellers to determine their opinion on solid waste management, willingness to participate and to gather their perception on solid waste management improvement program.

Before implementation of the project, the field workers of *Waste Concern* motivated the slum dwellers of Shah Ali Bagh and Kolwala Para. They visited every household and explained the need for waste segregation and benefits associated with waste recycling and resource recovery (composting). In addition to informal meetings with the slum dwellers, formal meetings with leaders of welfare association of the slums were also held. Before installation of barrel for composting, the female members of the slum were provided hands-on training on how to segregate waste and dispose their organic waste in a specially designed barrel. In addition to this, monthly cleanliness day of the slums was introduced and slum dwellers were motivated to participate in the program. The whole process of community mobilization and awareness took almost four months, before actual implementation of the project.

4.0 IMPLEMENTATION OF THE PROJECT

Before starting the project, one of the major problems in these slums was lack of adequate access. Most of the internal pathways were only 2 feet wide while others were 4 or 5 feet. With such narrow internal pathways it was difficult to place the barrel in the area. *Waste Concern* prepared base map of the slums and handed it over to the slum association and motivated them to realign some of the dwellings for better access and space for placement of the barrels. Once the internal roads were widened, the slum dwellers were asked to form groups for having one barrel.

Initially, it was planned by *Waste Concern* to form a group of four households for using one barrel. Due to space constraint in the slum it was subsequently decided with the dwellers to form a group with six households. After formation of the groups, the group members selected the location of specially designed barrel. Twenty such locations were identified by the group members for placement of specially designed barrels for composting and four locations for normal barrel for disposal of the generated in-organic waste.

4.1 Composting Technique

A specially designed 200 liters perforated green barrel with a lid was supplied to the slum. One green barrel, provided to a group of six households, was placed on a raised base with concrete ring. The cost of each specially designed barrel along with the civil work was around TK. 1800 (US $ 36). The slum dwellers were imparted training and motivated to dispose their kitchen waste into the green barrel. Waste decomposed aerobically into compost in three months time. Generally, in low-income settlements, major portion of the waste generated is biodegradable. Slum dwellers were motivated to dispose their inorganic waste in the yellow barrel provided by *Waste Concern*, which was subsequently carried to nearby Dhaka City Corporation (DCC) dustbin, for final disposal. The quality of compost produced by this method was tested at the Soil Science Laboratory of the University of Dhaka, shows that it has good nutrient concentration (Nitrogen 1.3%, Phosphorous 0.62% Potassium 0.8%, pH 7.5).

4.2 Marketing of Compost

The compost produced in the barrels has been purchased by *Waste Concern* at the price of Tk. 2.5 per kg from the slums. After maturing and screening the compost was packed and sold to fertilizer dealers. *Waste Concern* plans to link fertilizer dealers with the slum dwellers to directly purchase the compost produced in the slum. It has been found that from one 200 litter barrel compost worth between Tk. 1000-Tk.1200 can be produced each year. In Shah Ali Bagh Slum 1000 kg of compost was produced in the first three months, while in second three months 1400 kg compost was produced from 20 barrels. The households sharing the barrel will also share the income (Tk.1000-Tk.1200) from sale proceeds of the compost. With proper maintenance each barrel can be used for five years. The slum dwellers have been quite enthusiastic about the project as they are earning extra income from their waste, which was previously creating pollution and nuisance in their locality. Now the waste has turned into a resource for them.

4.3 Financial Feasibility of the Project

Production of compost involves fixed cost for purchase and design of barrels and civil works for construction of raised base for placement of barrels. Table III.9 shows the fixed cost involved in barrel type composting project at Shah Ali Bagh of Dhaka City as well as revenue earned.

Table III.9 Fixed Cost Involved in Barrel Type Composting vis-à-vis Revenue Earned from Shah Ali Bagh Slum

Item	Cost (Tk)	Compost Produced (Ton)	Revenue (Tk)
Purchase of 20 barrels along with modification and civil works @ Tk 1800/barrel	36,000		
Compost produced from 20 barrels @ 448kg/ barrel/Year		8.96	
Sale of 8.96 tons of compost from 20 barrels @ Tk. 2.5/ kg			22,400
Total expected earning in 5 years		44.8	1,12,000

Note: 1 US $= Tk.50

It may be seen from the above Table, that by proper marketing, barrel type composting can be a sustainable approach for solid waste management of slums as well as in other areas. In Dhaka, organic manure is at present being sold between of Tk.10 to 15 per kg in nurseries.

4.3 Other Benefits from the Project

Apart from the financial benefit to the slum dwellers, there are a number of other advantages of barrel type composting, as proven by the pilot project. These may be enumerated as:

- Decrease in waste management cost by reducing substantial volume of the solid waste generated in the slums.
- Improvement in overall health and environment of the slum by reducing illegal disposal of waste on roads, drains or vacant lots as solid waste is directly disposed in the barrels for composting by the slum dwellers.

- Promotion of 4Rs (Reduce, Reuse, Recover, and Recycle) concept at community level.
- Creates income generating opportunity from resource recovery.
- Returns organic matter in the soil and minimizes the use of chemical fertilizer.

5.0 LESSONS LEARNT

- *Barrel type composting is technically feasible for slums.* However, as majority of the slums do not have adequate space for placement of barrels, realignment of some of the slum dwellings is required for its placement.
- *Barrel type composting system is socially acceptable* as the project is running satisfactorily for a considerable period of time (2 years).
- *Community based projects have demonstration effect.* After observing the benefits (income generating opportunity, health benefit and overall environmental improvement) slums dwellers of adjoining neighborhoods are showing interest and requesting *Waste Concern* to take up similar project in their respective areas.
- *Smell problem is observed during monsoon period from the barrels.* As the project slum has no drainage facility, temporary water logging has been observed. Water percolating in the barrel creates some smell. In order to solve the problem, *Waste Concern* raised the base of the barrel by 10 inches, which prevented percolation of water in the composting barrel.
- *For large-scale replication of the concept, assistance of local government institution is necessary.* Moreover, necessary policy is also required to promote resource recovery and recycling.

6.0 SCOPE OF REPLICATION & RECENT DEVELOPMENTS

Local Government Engineering Department (LGED) of the Government of Bangladesh is planning to replicate this model of solid waste management in its rural market (growth center) improvement projects. However, they have included the barrel type-composting model in their growth center development guideline.

7.0 SUPPORT REQUIRED FOR SCALING-UP

The experience gathered so far by the pilot projects of *Waste Concern* demonstrates that this type of solid waste management can be replicated in the slums of Dhaka

and elsewhere in Bangladesh as well as in other Asian countries. Realization of full potential of this type of project, however, can only be achieved if the government or municipal authorities provide the following supports:

- Barrel should be provided free of cost or at nominal price to the slums in the initial stage.
- Policy level change is required to encourage community based recycling and resource recovery.
- Training and technical advice to the slum dwellers.
- Assistance in marketing of compost.

COMMUNITY BASED SOLID WASTE MANAGEMENT PILOT PROJECT IN KHULNA CITY: PROBLEMS AND PROSPECTS

by
Tanveer Ahsan
and
Shafiul Azam Ahmed

1.0 BACKGROUND

Khulna is the third largest city in Bangladesh and is a gateway to the nearby seaport. It has a flat terrain. There are several industrial activities in and around the city (see Box III.1).

Box III.1 Khulna City Profile

Estimated population (2000)	1.2 million
Population growth rate	5 % per year
Area	70 sq. km
Number of households(1991)	138,000
Number of city Wards	31
Low-income households	approx. 30 %

Khulna City Corporation is responsible for the operation and maintenance of municipal services including solid waste management. The solid waste management services comprise of the collection of waste from approximately 1,200 masonry bins, constructed by the City Corporation, located on roadsides throughout

the city. Households are expected to dispose of their waste in the masonry bins. The waste is then transported to its final disposal site (approximately 8 km from the city) by trucks provided by City Corporation.

Despite the efforts of the City Corporation, heaps of waste remain uncollected in many parts of the city. The inhabitants of the city do not always place their waste in the masonry bins but frequently dispose of it in the nearest available locations such as open drains, free land and around the provided waste bins. The City Corporation's trucks, however, only pick up waste from the roadside bins. It is estimated that out of the total 200 tons of waste generated daily, only a third of it is collected. As a result an unhealthy situation prevails where the uncollected waste blocks drains creating water logging and environmental problems.

2.0 THE PILOT PROJECT

The inspiration of the community based waste management activity came from the works of an enthusiastic young man, Khurram Mahboob, to address similar solid waste problems in his neighborhood in Dhaka City. After lots of effort and motivational work he convinced the local households to pay for a door-to-door waste collection service. The results of this system were considerable: the locality was significantly cleaner; and, drains were no longer blocked with waste leading to a reduction in water logging and problems with mosquitoes. The initiative is still working and has been replicated by several NGOs in Dhaka City.

Based on the above idea the pilot project on community based solid waste management in Khulna City was initiated in March 1997 for a period till December 2000. The total cost of the project is Tk.13.6 million (US$ 315,500). The roles of the different project partners are shown in Box III.2.

Box III.2 The Project Partners

The Communities (in the project areas)	Management of the primary collection system in their localities and contribution toward its costs.
Khulna City Corporation (KCC)	Collaboration, institutional support and onward links to municipal systems.
Prodipan (an NGO)	Lead agency to implement the project activities.
Swiss Agency for Development and Cooperation (SDC)	Management and project funding.
Water and Sanitation Program (WSP)	Strategic supervision and technical support.

The project activities can be divided into three main parts: project initiation, community preparation and operation of primary collection system (see Figure III.3). This paper mainly discusses the community preparation part of the project. The project initiation part consists of preparatory activities to start the project interventions. During this part an agreement was reached between Prodipan and the Khulna City Corporation (KCC) to carry out project activities. KCC allowed Prodipan to collect monthly subscription for the addition services they would be providing and a Memorandum of Understanding (MOU) was signed between KCC and Prodipan for this purpose.

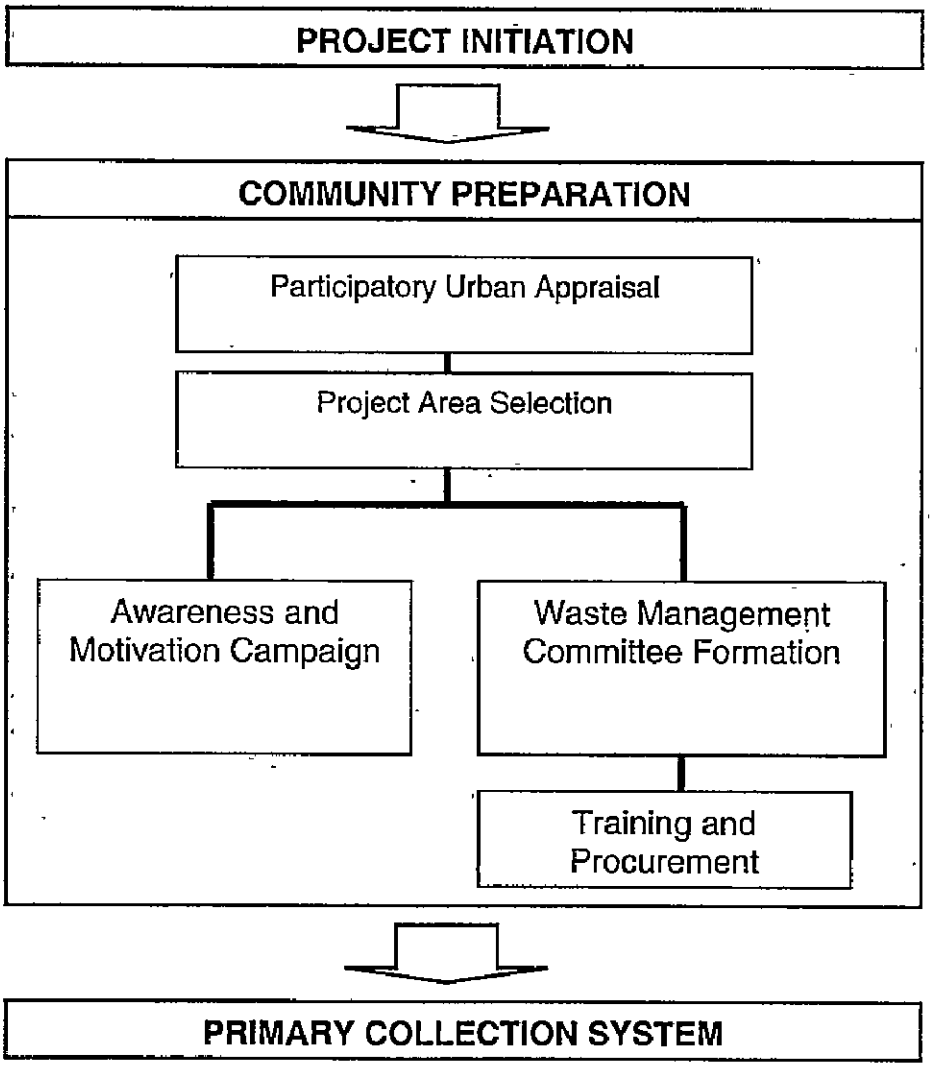


Figure III.3 Diagram showing the three major parts of the project

3.0 THE COMMUNITY PREPARATION PROCESS

Because of the problems of the conventional approach in solid waste management it failed to give the desired benefit from the service. The major project activity was to establish a community-based approach where the responsibilities are shared among the communities (as well as households) in a locality and the city authority. Box III.3 describes the conventional approach and its problems. It also explains the elements of the community-based approach.

A vital aspect of the project was to increase community awareness and participation, a solid waste primary collection system that attempted to operate without community support would be doomed to failure. The main components of the community preparation process are described below.

3.1 Participatory Urban Appraisal

The main objective of the Participatory Urban Appraisal was to select appropriate areas for project interventions and to form a background for the planning of subsequent project activity. On completion of the appraisal sessions, outcomes were analyzed and recommendations were made for future action. Many of these were adopted by the project in the subsequent planning of project activities.

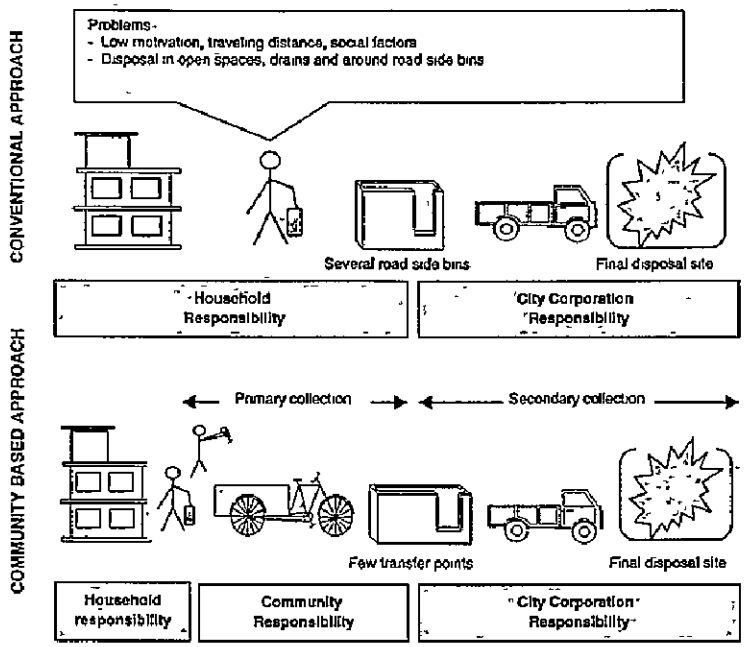
3.2 Project Area Selection

The project preliminarily identified several potential city wards, which represent populations of different income levels and different city characteristics (built-up, peri-urban, slums, etc.). A description of the project areas is given in Table III.9.

3.3 Awareness and Motivation Campaign

An awareness and motivational campaign was undertaken by Prodipan to bring about behavioral changes for good practices in solid waste management. Promotional activities like rallies and "Environmental Weeks" were carried out each year to address the whole city however more intense activities were taken in project areas. Posters and leaflets to promote good citizen practices and information on project activities were distributed and posted in strategic public places.

Box III.3 Schematic diagram showing the conventional and community based approach to solid waste management



The Conventional approach to solid waste management

Waste is generated in the home and is usually stored until a small amount has been accumulated It is the responsibility of the generating household to transport the waste to the nearest roadside bin which is provided by the City Corporation The City Corporation is responsible for the transfer of this waste from the roadside bins to the final disposal site.

Problems with the conventional approach

In many cases the City Corporation fails to provide a sufficient number of roadside bins or does not position them in convenient locations or ensure that they are of a convenient design. As a result the householder may dump the waste at a place close to their houses. This may be in open spaces, drains or simply around roadside bins. The householders may not be well-motivated to dispose of their waste properly in the roadside bins due to low awareness of the hazards of poor solid waste management or social factors that may make it unacceptable for certain members of the household to transport the waste to the roadside bins There may also be problems in the collection of waste from the roadside bins and its transport to the final disposal site due to lack of capacity of the City Corporation. This may be due to institutional problems or a lack of money.

The Community based approach

In Khulna the city wards are divided up into smaller areas, called primary collection blocks. These consist of approximately 500 households which are all served by one rickshaw van. Waste generated in the home is stored and collected everyday by a primary collector (e.g., van driver) The primary collector then transports the waste to nearby transfer points, normally by a rickshaw van This is primary collection and is the responsibility of the community. Transfer points are a place or facility where waste is unloaded from primary collection vehicles so that it can be taken away by secondary transport. Several primary collection blocks are served by a transfer point. The waste is then collected from the transfer points and taken to the final disposal point by a large truck. This is secondary collection and is the responsibility of the City Corporation.

Table III.10 A description of the project areas

Name of Thana / Area	Ward No.	Characteristics of the Ward	No. of Primary Collection Blocks	No. of House -holds	Population
Daulatpur	6	Located in city periphery. Mostly peri-urban area and there are many agricultural lands.	2	963	4,728
Khalispur	12	Located along the river. Mostly industrial area, many factory workers live here and there are few slums	6	2,961	23,924
Sonadanga	17	Built up area for higher income people. Organized housings	4	1,334	8,416
Khulna Sadar	24	City central area. Mixture of high middle people and traditionally people with education profession live here.	5	2,377	12,606
Khulna Sadar	27	Majority middle income people, municipal market	6	3,116	13,734
Khulna Sadar	28	Mostly low income people	3	1,454	6,536
Total	**6**		**26**	**12,205**	**69,944**

In project areas, ward-level rallies are organized each year. The local ward commissioner and local NGOs, CBOs mostly lead these rallies, and prominent local citizens, etc., took part. Promotional leaflets were distributed and posters displayed in different public places. Under the project, Prodipan had employed social organizers to carry out awareness and motivational works (as well as providing support to supervising local waste collection) in the project areas. Small group (5-10 persons) meetings are regularly organized by social organizers. This allows discussion of local waste related problems and sharing of experience on resolution-strategies.

3.4 Waste Management Committee

In parallel with the awareness and motivational campaign, the Prodipan social organizers helped communities in each collection block to form a committee that would lead the activities and solve any local problems. The social organizers identified potential committee members (including women) who were enthusiastic, generally acceptable to the local population and had influence in the locality and approached them individually. They were mostly school teachers, lawyers, and social workers. The social organizers explained to them the project objectives and activities and the valuable contribution they could make in improving the local environment. After a few meetings, some of the individuals agreed to participate in a local Waste Management Committee (WMC). These Committees were formulated before starting the waste collection in their areas. At present there is one Waste Management Committee for each of the 26 blocks.

3.5 Training and Procurement

Box III.4 Investment cost for primary collection system for one collection block

Items	Cost
Rickshaw van	10,500
Tools	800
Protective clothing	500
Total Cost, Tk.	**11,800**

** At present rate 1 US$ is approx. Tk. 50*

Prodipan staff trained them in collection and disposal method, routing of vans, hygiene, interaction with households and routine maintenance of the vehicles. The van drivers and the assistants also were provided with protective clothing (overall, shoes and mask) and tools (spade, bucket, etc.) for safe and efficient waste handling.

Rickshaw vans were manufactured in a local workshop. The investment cost for the operation of a primary collection system for one collection block (a rickshaw van and accessories) is Tk. 11,800 (Box III.4). A van driver and an assistant are assigned to each rickshaw van. They were selected jointly by the Waste Management Committee and Prodipan. Prodipan recruited and trained them in collection methods, hygiene, routing of vans, interaction with households and routine maintenance of equipment.

4.0 OPERATION OF PRIMARY COLLECTION SYSTEM

The primary waste collection system comprises of daily house to house collection by rickshaw vans. The project strategy is to extend the collection services to all categories of people. Households gather their day's waste in plastic bags or

Box III.5 Monthly operating of cost a primary collection system for one collection block

Items	Cost
Van driver's salary	1,600
Assistant's salary	500
Supervision costs of WMC	600
Repair and maintenance	50
Deprecation cost	250
Total Cost, Tk.	**3,000**

containers and hand those over to the van driver. The van transports the waste to a local transfer point. These transfer points are located by the side of main roads and their locations had previously been agreed with the City Corporation. The City Corporation trucks load waste from the local transfer points and transport them to the final waste disposal site (see Box III.3).

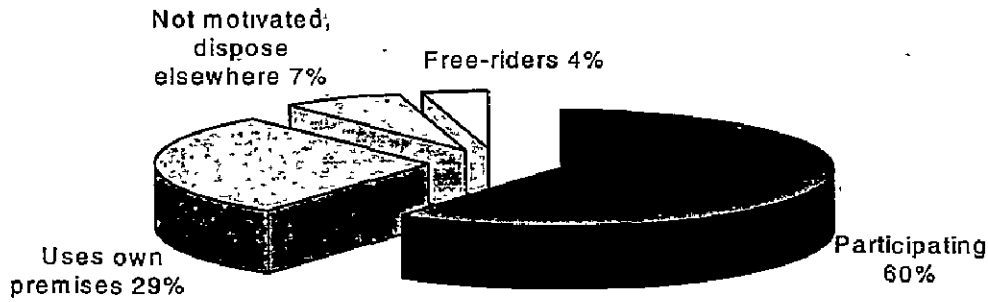
The operation of the primary collection activities during the project period is managed by the Waste Management Committees with support from Prodipan. The intensity of Prodipan's support is gradually reducing and it is expected that the Waste Management Communities will be able to operate and maintain the system themselves after completion of the project. The costs for the operation and maintenance of a typical primary collection system for one collection block, that will be managed by the Waste Management Committee, is estimated to be Tk. 3,000 per month (Box III.5).

The Waste Management Committee decides the monthly fees for the different categories of households. The monthly fees started at Tk. 2 – 5 per month to promote their services but now the fees have risen to Tk. 2 – 10 per month. The cost recovery is now about 70 % of the total costs (including deprecation). An analysis of the household participation is shown in Figure III.5. On an average 60% of the households in the project area are participating in the collection system. Out of the remaining non-participating 40%, the majority, i.e., 29% lives in areas that are of rural characteristics. These households dispose their waste in an open excavation within their own premises as practiced in rural areas. The actual non-participation is 11 % of which 7% are still not motivated and another 4 % do not pay.

The Waste Management Committees plan to increase the fees to Tk. 2 – 20 per month and further increase the system efficiency by the end of the project period. This rate is expected to cover the total operation and maintenance costs plus a

marginal profit. At this point the primary collection operation would be financially feasible for running by CBOs or micro-enterprises.

Figure III.4 Status of Household Participation



5.0 PROJECT EXPERIENCES

- At present the primary collection system is functioning in the 6 Wards under the project. Majority of the people from all strata is participating in the primary collection system. The motivational and awareness campaign had a marked influence on the behavioral changes among the local population. They no longer continue their bad practices like throwing garbage in open drains or all around roadside garbage bins but instead hand over their daily waste to the rickshaw van driver and pays a monthly fee for this service.
- The Waste Management Committees initially started supervising the waste collection activities and the awareness campaign in their locality with active assistance from Prodipan. The communities will fully take over the management of the primary collection system by the end of the project period and they are currently being prepared for that. However, at this moment some support from Prodipan is required.
- It was demonstrated in the project areas that an effective integration between community operated primary collection system and the city corporation operated solid waste management system is possible.

5.1 CHALLENGES

- Financial sustainability of the primary collection system. Possible ways that are being considered to increase the income are: (i) to increase the monthly payment rates, (ii) to increase the household participation, and (iii) to reduce the operating costs.
- Capacity building of Waste Management Committees and their linkages to the permanent organizational structure of the City Corporation. Discussions are going on at present within the Waste Management Committees and in the City Corporation to design ways for the linkage.
- A legal framework for wider application and enforcement of rules to discourage non-participation and non-payments.
- Policies to encourage the participation of private sector, micro-enterprises, etc.

COMMUNITY BASED SOLID WASTE MANAGEMENT: EXPERIENCE OF EXNORA

by

M. B. Nirmal

1.0 INTRODUCTION

It is expected that by the middle of next century, two thirds of the population will be living in cities. A large chunk of village population will migrate to cities and at the same time many villages will grow into cities. The consequences are expected to be severe in terms of quality of life and cannot be fully foreseen. Local governments, particularly those in the developing nations are finding even the present urban population unmanageable and they experience a lot of difficulties in providing the basic infrastructures. Sanitation is the main victim of urbanization. Urban planners and administrators seem to be perplexed with the enormity of the problems and as a result they have failed to take note of "easy to implement" solutions that are available.

2.0 HOW RURAL ISSUES BECOME URBAN PROBLEMS

This paper will first examine how rural issues became responsible for overcrowding of the cities and the consequent breakdown of sanitation in cities.

2.1 Rural Issues

2.1.1 Inadequate Infrastructure

More and better infrastructure has been made available in cities than in villages, when compared to the percentage of population living in both these areas.

2.1.2 Watershed Degradation and Water Pollution

Large-scale deforestation in rural areas has resulted in destruction of watersheds, depletion of ground water and soil erosion; water sources got polluted by industrial activities in rural areas.

2.1.3 Unsustainable Agricultural Practices

Water: Non-economical usage of water; abandonment of water conservative method;

Chemicals: Unsustainable use of fertilizers results in proliferation of pests and to fight pests. Pesticides are used which in turn leads to more pesticide resistant pests, which necessitates use of more powerful pesticides. The destructive cycle goes on.

Both these lead to the farmers' dependency on external inputs, making farming less and less profitable and unsustainable.

2.1.4 Decline in Institutions for People's Participation

Community participation declined due to replacement of traditional "Panchayats" with institutional government at the rural level. For example, canals used to be periodically desalted voluntarily by the local rural communities. They would also desilt temple tanks on a semi-voluntary basis. This declined as the village administration became more formalized and the village headman who was part of the community and lived in the community got replaced by the formal Village Administrative Officer, an outsider.

2.1.5 Perception of Cities as Places of Greater Economic Opportunities, Having Better Infrastructure, Education, Healthcare, Employment Opportunities, etc.

The factors mentioned above have resulted in large-scale migration of villagers to cities.

2.2 Rural Issues Become Urban Problems

When the people migrate from village to cities they have insufficient access to land and invariably this leads to mushrooming of informal settlements, overcrowding and depletion of environmental resources including air and water.

When there is overreliance on the local government and inadequate infrastructure in dealing with issues like sanitation, we find that delivery of services by institutions like Municipal bodies break down. The Central/State/Local Government is not equipped to cope with this change in urban population. For example, The Madras City Municipal Corporation Act of 1912 merely refers to removal of "rubbish" and not comprehensive management of waste. This is because at that time, waste was mostly organic and of low volume, which could get decomposed on disposal at dumpsite and return to nature. Today, waste consists of chemical, composite and other non-recyclable materials. This coupled with increased volumes of wastes resulting from change in consumer patterns, makes the 1912 Madras City Municipal Corporation Act irrelevant.

Barely half of the waste is carted out of most cities in the developing world. The rest of the waste lies uncleared in streets.

The waste is dumped in marshy wetlands and water bodies causing serious pollution of air, water and soil. The overall consequence of the neglect is decline in quality of life.

The local bodies suffer from inadequate income, which is also an important reason for unclean cities. Day-in Day-out newspapers expose the inadequate service of the local bodies by publishing photographs of unremoved and accumulated garbage. Hospitals, particularly those owned by the government are finding it difficult to cope with the increasing patients suffering on account of various ailments mainly due to lack of sanitation.

The most important factor contributing to insanitary conditions in developing nations is mishandling of solid waste. Local bodies do not have people's co-operation, money, know-how and motivation. The general population lack interests and are non-participants. They forget that it is they who create waste and hence have a moral responsibility in tackling or helping the local governments to tackle the problem of waste disposal. People's awareness on the hazards of excess generation and improper disposal of solid waste is appallingly inadequate. They call it garbage. Some others call it trash. The emphasis is merely on transportation and disposal. Transportation and disposal of garbage has become a problem of such a magnitude, now a new discipline of Solid Waste Management has evolved which does not adequately address the issue of "environmental sustainability"

The stress should be to use voluntary human resource which is available in abundance through people's participation in Environmental Planning Management on civic issues, more particularly in Solid Waste Management and to convert "waste into wealth".

3.0 EXNORA ENTERS THE SCENE

A few concerned citizens found the situation alarming. They found there was a big vacuum due to people's non-participation. Majority of people lacked discipline. Garbage was often dumped all over the streets rather than into municipal garbage bins round the clock. As a result, even where the municipal authorities regularly cleared the garbage, cleanliness was not achieved. Exnora International having a number of objectives entered the scene and focused on its Environment cum Civic Objective.

The result was birth of networking community based organizations (CBOs) called **Civic Exnoras** formed essentially to deal with urban issues. Exnora initiated the community participation by identifying a problem which was of common concern to all, i.e., Solid Waste. Though there were many aspects to the problem of insanitation, solid waste assumed all importance due to its visibility. Exnora used Solid Waste as a tool to bring people together. Originally the only agendum was to keep the street clean by carrying on the primary collection. But Civic Exnoras soon expanded their activities to solve their other civic problems such as sewage disposal, storm water disposal, street-lighting, etc.

3.1 Approach to Solid Waste Management

3.1.1 Identification of Problems

Accumulated Garbage

Accumulated garbage along roadsides and overflowing dustbins, which were not cleared frequently. These wastes (mostly organic) putrefy and posed serious health problems.

Ragpickers

Several hundreds of ragpickers, who depended on these very wastes for their living, by retrieving recyclables from them and selling them to waste recyclers, were often exploited and had appalling working conditions.

3.1.2 Solutions

Door-to-Door Waste Collection

Exnora organized a system to waste management which addresses both the problems mentioned above. The program started in 1989 was to motivate each household to collect all their domestic waste in a basket and hand over the same to the Civic Exnora's "Street Beautifier" who would collect the same in tricycle carts. Very soon the roads covered by Exnora wore a clean look. The success of the new system caught on in several other places in the city and within a few years of its founding Civic Exnoras were multiplying in number, with the concept being extended and expanded to all parts of Tamil Nadu. The adage is "Inspiration is caught, not taught".

The monetary resource for micro-level solid waste management came as subscription of Rs.10, US$ 0.25 (25 cents) from all residents of the local community. The amount was meager but the benefit was astonishing. Today in Chennai alone Exnora's contribution to the Solid Waste Management expenditure has been computed approximately as Rs.270, 00,000 (3000 Civic Exnora Rs.750 collected every month into 12 months. This worksout to US$ 6,75,000 annually spent directly by communities in Chennai alone for improving their quality of life).

3.1.3 New Problems

The work was carried as a partnership program with the Municipal Corporation. Civic Exnora street beautifiers were asked to do the primary collection and take the trash to a transfer station /transfer points.

But a fresh problem started. Earlier hardly half of the garbage was removed by the local body. But due to the primary collection by Civic Exnoras ensuring collection of entire garbage and their being brought to selected points, the local body found it a big challenge to do secondary collection since they lacked proper infrastructure and there appeared garbage mountains at every collection point. Newspapers started publishing photographs of accumulated garbage and Exnora became the "offender." In short, secondary collection by local bodies did not match the primary collection by Civic Exnora, resulting in bottlenecks.

The work carried on by Exnora was "so far so good" but Exnora realized that it amounted to nothing but shifting the problem from one place to another and certainly it was not management of solid waste.

Further the city did not have sanitary landfill sites. The local body therefore found it convenient to convert two prime wet lands at the end of North and South of Chennai City, respectively as dumping ground. This has resulted in environmental degradation of soil, sub-soil, ground water and air. In this background Exnora's members started upgrading their activities. The street beautifiers started to receive informal training to segregate waste as recyclables and compostables and sell the valuable part of it. This became additional income for them.

This again had its own problems. Segregating garbage which was already mixed up posed a serious health threat to the street beautifiers. It was also found out that a major part of compostable waste and recyclable waste after having got mixed up, losing their very nature and basic characteristics. The next step forward was introduction of an Integrated Solid Waste Management resulting in Zero Garbage Management. This program included source segregation, door-to-door collection, decentralized composting of organic waste, source segregation and recycling of inorganic waste and landfilling of non recoverable waste.

The program also has other facets like Zero Waste Home and Zero Waste Colony. In Akshaya Colony, the residents practice Zero Waste Colony. The organic waste is composted and recyclable waste is sold to scrap shops. In bigger cities like Hyderabad, Exnora could successfully transport the Monda Market vegetable waste to Indira Park and carried there a massive windrow composting.

Exnora concepts were carried to schools. Student Exnora Program (STEP) included composting the school's organic waste with the school children taking active part.

In Cochin, Exnora was successful in introduction of Zero Waste Municipal Ward by establishing Zero Waste Centers.

By and large today Exnora is a big success. No doubt, problems crop-up now and then. Exnora had its own novel ways to solve them. The problem of lack of co-operation from local authorities was solved by organizing "face-to-face programs/meetings between the people and the local government. The local government was represented by elected representatives and officials and people by Civic Exnoras and Residents Welfare Associations.

Exnora even went to the extent of nominating the elected Municipal Councilors as Advisors to its Zero Waste Ward Program as well as to Civic Exnoras.

In order to bring people together and involve them to take up environmental issues, Exnora evolved a number of strategies like mass cleaning campaign of streets/mosques/ churches/ temples, community get-togethers, Rangoli Competition etc.

In the process, people developed ownership toward their road and city. They swung into action by achievement motivation. Forum of Civic Exnoras (FORCE) was formed to facilitate the Civic Exnoras in a ward to network and share their good practices. Civic Exnoras, the micro level people's institutions helped to bridge the gap between the people on one side and the Administrative Elected representatives on the other. For example when the Chitlapakkam Environmental Program was jointly developed by Chennai Metropolitan Development Authority and Exnora, local representatives came up with the people's plan for developmental activities in their area.

4.0 CONCLUSION

Let us not forget that though the developing nations might have several millions of starving stomachs, nevertheless they also have several millions of brains and pair of hands. Exnora understood that we waste natural resources by misusing them, we waste human resources by not using them. "By using human resources more, we can certainly save a lot of natural resources".

PART IV

PUBLIC-PRIVATE / GO-NGO PARTNERSHIP IN SOLID WASTE MANAGEMENT

USE OF COMPOST BIN AS AN ALTERNATIVE SOLUTION TO HOUSEHOLD SOLID WASTE PROBLEM IN URBAN AREAS: A CASE STUDY OF COLOMBO, SRI LANKA

by

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and
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1.0 A BRIEF DESCRIPTION OF THE PROJECT

Like many other cities in the developing countries, the city of Colombo too has been experiencing difficulties in managing its solid waste. The Colombo Municipal Council is the sole authority responsible for collection and disposal of solid waste in the city. In the meantime the Ministry of Environment and Forestry has been exploring various opportunities to tackle this issue at national level. NGOs and civil society organizations have also been active in contributing their share to solve the problem of urban solid waste management at community level.

In this process of searching alternatives, the SEVANATHA organization, an urban based NGO has experimented the use of a compost bin for disposal of household garbage during the latter part of 1997. The experiment proved successful and therefore it has initiated a program called introducing a compost bin for household waste disposal since the beginning of 1998. At present, this program has developed as a main community based solid waste disposal system in Colombo as well as in several other urban areas of Sri Lanka.

2.0 KEY THEME OF THE PROGRAM

The compost bin program advocates the theme "We Must Start the First Step toward Marching for Environmental Protection from our Own Home". This theme provides the program with a broad framework to address the solid waste issue of which ultimate aim is to reduce the environmental consequences generated due to improper disposal of urban waste.

3.0 THE COMPOST BIN PROGRAM

3.1 Key Considerations of the Compost Bin Program

The program on hand considers the following assumptions:

i. It strongly believes the need for alternative approaches to the conventional municipality dominated solid waste management in cities.
ii. It believes that the communities and every households who generate garbage must bear part of the responsibilities for proper disposal of their own waste.
iii. It believes the need for attitude changes of households and communities to rely on their own capacities and resources to contribute to solve the city's solid waste management problem.
iv. It believes that the communities can positively contribute toward reducing the volume of waste released to the city's waste stream.
v. It is also believed that people's organizations, NGOs, local authorities as well as the government should jointly work toward addressing the urban solid waste problem.
vi. It believes that the concept of reducing waste, reuse and recycling can effectively be introduced at the community level that can be scaled up with the support of LAs and GOs.

3.2 Key Components of the Compost Bin

The main components of compost bins are:

- GI bins with 45-gallon capacity used for storing food related goods are used for disposal of household garbage. The use of secondhand bins itself is attached to the concept of "reuse of material".
- The bottom face of the bin is removed and ventilation holes are provided on the top half of the bin. Six slots of ventilation holes (consisting about 80

holes per slot) were provided to ensure adequate cross ventilation inside the bin.

- One half of the top face of the bin is removed to have a wide opening on the top through which garbage is put into the bin.
- Both sides (interior and exterior) of the bin is painted with a layer of anticorrosive paint with a green color finish for visual beauty and protection from weather.
- A GI lid is provided to cover the top of the bin to protect the bin from rainwater as well as to prevent animal and birds entering into the bin.
- A cement sand ring has been introduced to fix the bin so that the bin does not contact with he ground as well as it prevents rats being entered through the bottom of the bin.

3.3 How to Install the Bin

- The space needed to keep the compost bin is about 3' x 3' area (diameter of the bin is 58 cm and the height is about 88 cm).
- It can be kept near the kitchen or even at the front side wherever space is available on the compound.
- It has to be kept at a place which does not go under water during the rainy days. A raised earth bed or at a high elevation point should be chosen to place the bin.
- It is important to keep the bin on the ground so that any liquid formed in garbage can get absorbed into the ground.
- Once a suitable spot is found on the land lot, the cement sand ring can be placed and the bin can be fixed on the ring. The top of the bin should be covered with the GI lid provided with the bin.

3.4 Instructions for Using the Bin

- The bin is mainly for disposal of kitchen waste of one or two families.
- Source separation of kitchen waste into biodegradable and non-biodegradable is a must. For this purpose, two vessels need to be used in the kitchen.
- For biodegradable wastes a plastic basket of about 30 – 40 cm height can be used. For non-biodegradable waste a card board box of 40 x 60 cm size can be used.
- Basically in an average family kitchen waste the following types of biodegradable and non-biodegradable waste may be generated daily.

Bio-degradable waste

- Vegetable parts
- Cooked food or raw food
- Fish and meat parts
- Fruit peelings and other food related stuff

Non-biodegradable waste

- Paper, cardboard packing
- Shopping bags
- Polythene
- Plastic

- All these non-biodegradables can be collected in the cardboard box which can later be disposed either to the municipal waste bin or given out to waste pickers.
- The biodegradable wastebasket can be emptied into the compost bin whenever the basket is full or in the evening of the day.
- During the first two weeks of using the bin, a slight smell may generate in the bin which will disappear with the growth of bacteria in the bin in about 2 to 3 week time.
- If you observe dryness of garbage in the bin you can sprinkle about one or two liter of water on the garbage once in two days.
- After about three month time you can extract a layer of dry compost which can be used in the home garden.
- The bin never gets filled up after decomposition process starts. A bin is quite adequate for a single family or two families who generate about 1.5 to 3.0 kg of kitchen waste daily.
- The lifetime of the bin may be about 5- 6 years.
- It is a low cost, simple and environmentally friendly method of household waste disposal, which does not demand a big space / land area or much time.

4.0 PROGRESS ACHIEVED BY THE PROJECT

The SEVANATHA – URC which has been implementing the compost bin program in Colombo since the later part of 1997 has achieved the following progress by reaching different level of urban population.

Table IV.1 Distribution of Compost Bins

Target Population	Number of Families		
	1997/98	1999	2000 (started and proposed)
i. Pilot projects in urban low income settlements implemented by SEVANATHA with donor support	40	70	1200
ii. Pilot projects implemented by urban local authorities	136	633	1200
iii. Middle and high income households purchased the bins individually	180	800	1400
Total	**356**	**1503**	**3800**

Source: Waste Reduction Program, SEVANATHA, February 2000.

5.0 LINKAGES OF THE PROGRAM WITH THE MUNICIPAL AUTHORITIES

The experience of SEVANATHA organization in building linkages with the municipal authorities was encouraging. Some of the interesting points are listed below:

- When we first discussed the idea about using the compost bin for household level garbage disposal with the municipal officials the immediate response was that they do not believe that it can help solve part of the solid waste problem in the city because they assume the people may not cooperate with such ideas and people always look for the municipality to dispose their garbage.
- Furthermore, most municipal officials perceive that the solid waste management problem is purely an engineering / technical problem where community has no role to play.
- However, when we implemented the first pilot project with about 10 families of a low-income group of 120 households and then explained them the process and the result, the municipal officials wanted to visit the site and admired it.

- Subsequently, the issues of scaling it up the issue of non-biodegradable waste disposal and lots of other limitations prevented them by seeing it as an appropriate solution.
- The SEVANATHA has moved further forward and produced information materials, conducted awareness campaigns for community leaders, school children and published small news items in national newspapers. All these information dissemination strategies help generating interest on the compost bin not only among municipal officials but also among most of the people in the city.
- Subsequently, requests for more information and for conducting awareness sessions were received from the municipal authorities.
- At present the SEVANATHA has already established linkages with the following local authorities.

Municipal Councils

1. Colombo Municipal Council
2. Sri Jayawardenapure Kotte Municipal Council
3. Dehiwala Mt. Lavinia Municipal Council
4. Negambo Municipal Council
5. Galle Municipal Council
6. Kandy Municipal Council

Urban Councils

1. Ja-Ela Urban Council
2. Kegalle Urban Council
3. Mawanella Urban Council
4. Seeduwa Katunayake Urban Council

Semi-Urban Local Authorities (Pradeshiya Sabhas)

1. Dehiowita Pradeshiya Sabhas
2. Wattala – Mabole Pradeshiya Sabha
3. Panadura Pradeshiya Sabha

- Most of these local authorities have started small scale pilot projects involving 20 – 200 households for introducing the compost bin program as an alternative method of solid waste disposal.

- In brief the strategies we used were as follows:
  - Less talk but more work and information
  - Convincing the officials through demonstrations
  - Compromise Vs confrontation
  - Letting communities to explain their experiences than NGO expressing its views
  - Trying to make it a people's program than an outsider trying to claim the ownership

6.0 SCALING UP THE PROGRAM

6.1 Possibilities for Scaling up the Program

The experience of the compost bin program enabled us to visualize its future and the possibilities for scaling up. The following reasons justify the possibilities of scaling up the program.

- Except in one or two rare cases all the families who use the bin are satisfied with its performance. They valve its simplicity and effectiveness.
- Responses received from different social groups such as from school children, civil society groups, lion club members, Rotarians, women's groups and especially government institutions for conducting awareness sessions prove that a large section of urban population is willing to participate in this program.
- The positive responses received from urban local authorities, Environmental Ministry, and academic community have been very much encouraging for popularizing the program.
- The capacity building at SEVANATHA organization to continue with the program is yet another aspect to be considered in this regard. At present 3 staff members work on full time basis on this program. The compost bins fabrication site is located in a low-income settlement of Colombo where about 3 – 4 unemployed youths find their daily wage.
- The program has already got established as a continuing activity of SEVANATHA organization, which can be further expanded.

6.2 Support Mechanism for Scaling up the Program

For scaling up the compost bin program support is required at two levels.

a. Support at national level by the Ministry of Environment and Ministry of Local Government.
b. Support at Municipal level local authority.

6.2.1 Support Required through National Level Institutions

i. Accept the need for introducing alternative solutions to urban waste management problem.
ii. Provide policy support for collaborative programs with NGOs and civil society groups.
iii. Accept the necessity of contribution by different stakeholder groups for solid waste management.
iv. Introduce policies to protect environment through greater community participation which involves tackling the issue of urban solid waste management.
v. Use public media and other strategies to create people's awareness about the need for their contribution toward the local authorities and government programs.
vi. Provide funding support as well as other resources to people's organization and NGO to promote community-based approaches such as the compost bin program.

6.2.2 Support Required through Local Level Institutions / Municipal Authorities

i. Introduce local level policies as well as programs aiming at efficient management of solid waste with the council area / city.
ii. Recognize and support the civil society organizations, NGOs and communities to initiate community level programs for solid waste management.
iii. Change public image about the municipal authority's willingness to change their roles and their responsibilities by involving public at large in the municipal solid waste management.
iv. Promote community awareness for change of attitudes for promotion of the urban environmental quality by reducing pollution and appropriate disposal of solid waste.
v. Provide incentives to civil society organizations and NGOs to implement alternative solid waste management programs.

7.0 CONCLUSION

- The compost bin program provides direct benefits to the user family by allowing it to save time, instigating inner satisfaction by being able to contribute positively to reduce the city's garbage problem.
- An element of attitude changes especially among the children of the family, making them disciplined for disposing their household garbage is yet another positive achievement of the program.
- Use of compost extracted through the bin is another benefit. Though it cannot be measured in terms of a direct monetary terms; it has attracted people to use the bin.
- The aspect of promoting micro enterprises through this program can be linked up with the reuse of non-biodegradable materials. The SEVANATHA organization has not started a micro enterprise out of this program as yet. However, it has already seen the possibility of initiating a micro enterprise.
- Starting a recycling center in a large low-income settlement, where over 1000 families have been living was considered for this purpose. When the community began to use the compost bin for disposal of biodegradable waste, most of the non-biodegradable can be collected at the recycling center (i.e. paper, plastic, bottles, metals, polythene, etc.). Such materials may be sorted out and make available for reuse. At this point, the demand from the business sector should be there to purchase such items. The recycling industry has not been yet an attractive area of business among local businessmen. Therefore, government intervention at this point of time would be essential to introduce policies that help creating a market for recycling and reuse of materials.

INNOVATIONS IN COMMUNITY BASED SOLID WASTE MANAGEMENT INITIATIVES: HYDERABAD EXPERIMENT

by

R. P. Sisodia

1.0 INTRODUCTION

To keep the body and the surroundings clean is one of the primary requirements of any civilized human being. The civil societies have always been grappling with the issue of hygienic and sustainable waste management. In the present institutional structure, the duty of keeping the public places clean is assigned to the municipal local bodies. The need to involve the community on a partnership basis in the field of solid waste management in order to ensure a sustainable system of primary and secondary collection and final disposal of the municipal solid waste was felt long back and efforts were made to develop and design systems and institutions supporting and facilitating the partnership of community in managing its waste. Several experiments have been conducted and several initiatives have been taken by various municipal local bodies in India to ensure community participation in the process of waste management in order to ensure sustainability of the endeavor.

The city of Hyderabad has been one of the forerunners in this endeavor. The quality conscious citizens of Hyderabad have been consistently demanding improvement in the sanitation services and the Municipal Corporation of Hyderabad has been constantly persevering the quality of services provided. Rather than perceiving the community as a receiver and the Corporation as a provider, several initiatives were launched to establish a partnership between the two. The present paper is an

attempt to present the experiences of Hyderabad in community based initiatives in the process of solid waste management.

Box IV.1 Solid Waste Management in Hyderabad at a Glance

Population	: 4.5 million
Geographical Area	: 168 sq km
Total Solid Waste Generated	: 2000 metric tons per day
Municipal Workforce	: 4000
Private Workforce	: 4500
Total Refuse Vehicles	: 400
Total Circles	: 7
Total Wards	: 52
Extent of Privatization	. 55%

2.0 PRIVATE PARTNERSHIP IN MANAGING SOLID WASTE

The Hyderabad City has received the **"Clean City Award"** for the current year from HUDCO, Government of India. This was made possible because of a very successful scheme of involving the private contractors, NGOs, CBOs and RWAs in the solid waste management. The efficiency and performance of the private contractors is substantially higher than that of the regular municipal staff. Due to this privatization, the city of Hyderabad has started looking very clean and has won laurels and appreciation of all the people. This privatization includes 160 kilometers of main roads where night sweeping is introduced.

Up to September 1998, the extent of privatization in MCH area was about 20%. However, it was noticed that this much of privatization was not sufficient and many areas were not attended to on a daily basis because of shortage of manpower. Since the population and the generation of garbage almost doubled in the last two decades, and there was no recruitment of workers during the last two decades, a need was felt to effect the privatization at least for half of the MCH area, since the number of workers of MCH further came down because of retirements and deaths. There are a total of 4000 regular MCH workers presently engaged in the sanitation duties. The average of one sweeper per 1125 population was too high by any standards, and some of the outlying areas were not served daily. That leads to piling up of garbage heaps and insanitary conditions in those areas. Therefore a decision was taken to saturate the entire city by providing daily services of sweeping and garbage lifting by taking up privatization to the extent required.

A decision was taken to review the existing contract system after the need was felt for expanding the privatization to the extent required in order to provide daily sanitation services to all the localities in the city. It was also felt that there was a need to devise a full proof system that had in built mechanism of ensuring best performance from the contractors. Consequently, a unique system called **"Unit System"** was designed and implemented from September 10, 1998. After implementation of this system, the private contractors are cleaning 55% of the area.

The MCH is also one of the first Corporations in the entire country to implement the system of night sweeping on busy roads and commercial areas. The system is working very well. When the citizens of Hyderabad start from their homes to go to the workplaces, they find the roads sparkling clean without even a trace of litter or garbage. It is a pleasure to walk on the roads of Hyderabad because of this system of night sweeping and garbage lifting.

3.0 COMMUNITY AS SUPERVISOR

Since the community is the biggest stakeholder in the entire enterprise of solid waste management, it is also expected of the community to exercise the maximum amount of supervision and monitoring over the persons responsible for primary and secondary collection of waste and transport. For this purpose, in all the units which have been privatized, **Unit Level Committees** of residents have been constituted and the responsibility of ensuring proper performance from the contractor is also devolved on them. The institutional structure and the procedure have been so modified to incorporate this new shift from the routine administrative supervision structure. These Committees also provide a formal interaction and feedback platform to the MCH functionaries.

Everyday the contractors are asked to approach the committee members and obtain their comments/signatures in the daily performance-monitoring chart. At the end of the month, the contractor has to produce the "Satisfactory Performance Certificate" from the community and only then his bills are cleared by the Corporation. In addition, whenever a complaint is received from the residents of an area, fine is imposed on the concerned contractor.

4.0 COMMUNITY AS DIRECT PARTNER

In addition to the private partnership in the solid waste management, several initiatives have been launched ensuring direct involvement of community in the

processes of primary and secondary collection as well as processing of the municipal solid waste in Hyderabad. These initiatives range from that of the community taking up the process of sweeping and garbage collection in the locality to that of the community taking over the processing of the garbage through Vermi-composting. There are two innovative schemes launched by the Municipal Corporation of Hyderabad to ensure direct community participation, which have been proved very successful. The details of the two schemes are given below:

4.1 Voluntary Sweeping Scheme

As is the case with so many other growing cities, the city of Hyderabad also faced the problem of extending sanitation services in the newly springing up colonies and localities. It was impossible for MCH to go on recruiting the staff in order to cater to the requirements of a growing city, which was growing at the rate of 60%. The solution to this problem was provided by a noble concept where it was envisaged that the citizens should be encouraged to takeover sanitation services in those areas on a partnership basis. The concept was given a formal and practicable shape by launching a scheme in the year 1994, which was called Voluntary Sweeping Scheme (VSS).

The scheme envisaged a partnership on 50-50 cost sharing basis. The Municipal Corporation of Hyderabad committed to bear 50% cost of maintaining the sanitation in the colony. The residents of the colony were authorized to engage required number of sweepers and the Municipal Corporation of Hyderabad promised to bear 50% of the expenses incurred on their wages. The residents were asked to form an association, get it registered and then enter into a formal agreement with the Corporation in order to take up the scheme.

This scheme has been proved successful and has yielded good results. Today there are 12 Resident Welfare Associations, that have adopted this scheme and are maintaining their own sanitation. The advantages of the scheme are manifold. In the first place the workers, since they are engaged by the association and not by the Corporation, are fully accountable and answerable to the association for their work and, therefore, their performance is far better than others. Since the RWAs are directly monitoring and supervising the work, the quality of sweeping and refuse collection is far better than other areas.

4.2 Voluntary Garbage Disposal Scheme

This scheme is a slight variation of the previous scheme. Many colonies and the slums in Hyderabad were earlier having community garbage bins and receptacles from which the Corporation used to lift garbage everyday or in some cases, on alternate days. Some of the conscious individuals perceived these receptacles and the sight, which they used to present as potential health hazards. Many found their presence in the locality to be aesthetically unacceptable. But at the same time the community refused receptacles were as essential as the roads on which they were kept.

The successive Municipal Commissioners and the enlightened citizens of Hyderabad jointly discussed and deliberated and a noble solution was found to this intricate problem. The unseemly sight of garbage bins became a thing of past for those colonies which adopted this solution. The scheme was called "Voluntary Garbage Disposal Scheme" and it was launched in the year 1994. The details of this scheme are as follows:

In the colony where the residents find the presence of community bins a nuisance, they can form an association and apply to the Municipal Corporation of Hyderabad for providing a tricycle free of cost to them. When any Residents Welfare Association wants to adopt the scheme of door-to-door collection of garbage with the help of tricycle, they have to approach the MCH with an application showing the number of households proposed to be covered under the scheme and apply for a tricycle free of cost to the MCH. The MCH sanctions one tricycle free of cost in the name of that particular Residents Welfare Association which covers about 100 to 200 households. The RWA engages any unemployed youth or a rag-picker for the purpose of driving the tricycle. Each household covered under the scheme has to pay an amount of Rs.10 to 20 every month to the person engaged by the Residents Welfare Association. This scheme serves the twin purposes of providing gainful employment to a rag-picker and at the same time converting the locality into a **garbage free locality**. This scheme has worked very well in Hyderabad city and at present about 610 such tricycles are in existence, which everyday go from house-to-house and collect the garbage and dump it at the pre-designated place. These colonies do not have any garbage bins and the associated sanitary conditions. The households, who have adopted this scheme, are very happy because they do not see any garbage in their area since the garbage is directly collected and dumped at a place, which is far away from the locality. The waste is then picked up by the

Corporation and taken to the landfill sites. The MCH is trying to encourage more and more Residents Welfare Associations to adopt this scheme. In addition to earning about Rs 1000 to 2000 every month from door-to-door collection of garbage, the tricycle pullers also earn some extra income by selling the recyclable after segregating it from the garbage collected from every house. The scheme also ensures that the recyclable material from the waste is segregated and recirculated and reused.

The MCH officers regularly interact with the citizens and RWAs informally and also formal meetings are conducted with the representatives of the NGOs, CBOs, citizens and the Associations almost every month. The difficulties faced by the MCH in ensuring cleanliness are brought to the notice of the people and their cooperation is sought in implementing new schemes. Because of the feedback provided by the citizens, the MCH is able to effectively supervise and monitor the work of sweeping and garbage lifting.

5.0 PARTNERSHIP IN WASTE PROCESSING

The concept of the **"Zero Garbage Colony"** is gradually picking up in Hyderabad also. Some of the colonies, which have adopted the VGDS scheme, have also started Vermi-composting of the garbage and production of good compost. The refuse which is generated in the colony never comes out of the same, rather it gets converted into very useful compost which can be utilized for enhancing the fertility of soil and raising kitchen gardens and lawns, etc. It can also be marketed by the association in order to generate revenues, which can be invested in the colony for making improvements in infrastructure facilities. The Municipal Corporation is encouraging such associations in adopting the scheme by providing free land and necessary infrastructure for taking up Vermi-composting. The open spaces available in the city belonging to the MCH are being utilized for this purpose. Three such schemes are presently in operation in Hyderabad.

6.0 LATEST INNOVATIONS

After having successfully implemented the scheme of private partnership and community involvement in solid waste management, the efforts are now on to ensure that since it is the community which desired a clean surrounding, the responsibility and the accountability of ensuring the same should also be handed over directly to the community. The following initiatives have recently been

developed and implemented which ensure that the primary stakeholders in the entire solid waste management takeover from the Municipal Corporation in an effective manner.

6.1 Community as Conservancy Contractor

It was felt that rather than performing the role of mere supervisors over the contractors, if the community itself takes over the operations of sweeping and garbage collection, the cleanliness of the city would further improve. Therefore, the idea of the community taking over as Conservancy Contractors was promoted and the Residents Welfare Associations, NGOs and Women Groups were encouraged to take over as contractors. In the new millennium 2000 Package that was launched in the month of December 1999, one association has taken over, as contractor for two units and the performance of this association is much better than the regular contractors. One more Resident Welfare Association has also come forward to take over as contractor. In addition, five NGOs, active in various welfare schemes, have adopted the areas of their operations for sanitation and have become Conservancy Contractors.

A slightly different version of the above concept is that of involving the Women Thrift Groups in Sanitation. Several Women Thrift Groups (DWCUA) are in existence in Hyderabad. On an experimental basis, it was decided to encourage some of these groups to replace the existing contractors. The scheme was launched with twin objectives of providing gainful employment to the thrift groups and at the same time eliminating the middlemen from the sanitation services. Fourteen groups came forward and they were given sanitation contracts in different areas of the city at par with the contractors. Only those DWCUA groups, which had been members presently engaged as sweepers, were selected. The performance of these groups is found to be quite good and it is further proposed to expand the scheme wherever possible and wherever the women thrift groups come forward to replace the existing contractor.

Like any other city in India, the existence of slums is a reality of life for Hyderabad. Maintaining sanitation in the slums is a daunting task for any local body for the reasons of inadequate infrastructure facilities and heavy garbage generation density. It is now proposed to involve the slums in maintaining sanitation. Thanks to the untiring efforts made by the Urban Community Development Wing of the Municipal Corporation of Hyderabad. Very strong and

vibrant community structures exist in all the slums of Hyderabad. These community structures, known as Neighborhood Groups and Neighborhood Committees are very active in most of the slums and these committees have started replacing the middlemen in all the municipal services including construction of roads and drains, etc. It is now proposed to encourage these committees to takeover sanitation as well in their own areas as partners. While the cost of maintaining cleanliness in the slums would continue to be borne by the Corporation, the operations and the supervision would solely be the responsibility of the slum committees.

7.0 CONCLUSION

The success of an enterprise depends a lot on the way its feedback system functions. To ensure that regular feedback is received from the public, several measures were taken. For this purpose, **"Consumers' Hotline System"** was introduced and the public was asked to telephonically lodge their complaints and offer their suggestions on telephone to the MCH. The complaints and suggestions received from the public are being computerized everyday and prompt action is taken on these complaints. The MCH today claims that it has been able to attend each and every complaint, regardless of the nature of the complaint, within 24 hours of its receipt in office. This is made possible by sensitizing the staff about the need to effectively redress the grievances of the public. The people of Hyderabad are very happy now and the number of complaints received has been substantially reduced.

The formal feedback from the public is received by the MCH by conducting regular interaction sessions with the NGOs, the Residents Welfare Associations and the general public. The MCH is effectively utilizing the print and electronic media also for communicating messages to the public. Feedback is also received from the newspaper reports and effective corrective action is taken as and when adverse press reports are received.

The community-based initiatives in the solid waste management are only beginning to take shape in India since it is an entirely new field. It provides an excellent fulcrum of shared responsibilities through which new horizons can be reached in waste management if proper institutional structures are established and consolidated. The Hyderabad City is proud to be associated with these efforts in which community and community structures are nurtured and encouraged to be active partners in the field of Solid Waste Management and there is a long road ahead full of promises and challenges.

EMPOWERING COMMUNITIES FOR SOLID WASTE MANAGEMENT: STRATEGIES AND PRACTICES

by

Bebet G. Gozun
and
Maria Judedia M. Palomata

1.0 BACKGROUND

Solid waste is now acknowledged to be one of the most pressing environmental problems in many urban and urbanizing areas in low and middle-income countries in the world. This is also true for the Philippines. In 1995, the Department of Environment and Natural Resources (DENR) commissioned the Social Weather Station to conduct a survey to determine what Filipinos living in urban and in rural areas considered as their most pressing environmental issues. The solid waste problem was consistently identified among the top three issues.

Although local governments have been given the authority to deal with solid waste, many have failed to provide adequate solid waste management services. Local authorities simply cannot cope with the growing demand for infrastructure and public services brought about by rapid and uncontrolled urban growth in terms of population, industrialization, commercialization and service activities. More people means more waste generated daily. And, more economic development also translates to higher waste generation per capita.

The Presidential Task Force on Waste Management in the Philippines (PTFWM) estimates that Filipinos in urban areas now generate about 0.5 kilograms of waste daily while those in rural areas are estimated to generate about 0.30 kilograms daily.

With so much waste being generated daily, collection cannot keep up. In spite of the fact that many already recognize solid waste as a serious problems (in the Philippines, even the President gets involved in the issue of solid waste), somehow, political priority given to waste and the social prestige of people dealing with waste remains very low. Thus, resources allocated are limited. Inadequate service coverage could also be attributed to improper planning, operational deficiencies, lack of skills training for those involved and the use of inappropriate technologies which causes inefficient use of time and resources. To make matters worse, authorities usually allocate resources to service the richer and more accessible areas where the residents can exert stronger political pressure. This leaves many low-income areas, including slums and squatter settlements, under–served or completely unserved.

A study funded by the Japan International Cooperation Agency (JICA) on Master Planning for Solid Waste Management of Metro Manila found collection efficiency in the metropolis to be 74%. The PTFWM estimates that the national average is only about 40%.

As a result, uncollected waste can be seen dumped in the streets, in any vacant lot, in storm drains or thrown directly into creeks, rivers, lakes and seas. Not only are these unsightly and smelly, but they also pollute the waters (both the groundwater and the surface waters), aggravate flooding in low-lying areas, serve as home to disease carrying vermin and insects. Burning, which is also resorted to, releases toxic emissions that pollute the air. All these pose serious health risks to the population and also substantially contribute to environmental degradation. They adversely affect the quality of life not only of the urban poor communities but also of the entire population of a locality and even those of the immediately surrounding municipalities/cities. These may also have negative impacts on the economy such as the tourism and investment potentials of an area.

2.0 GOVERNMENT EFFORTS TO ADDRESS THE PROBLEM

Recognizing this problem, local government has intensified their efforts to make collection more efficient. This generally meant the acquisition of more collection vehicles through direct purchases or through donations (such as those from the JICA). Others resort to contracting private corporations or individuals to either completely handle the collection for entire city/municipality or to complement the existing government capability in some parts of the city/municipality.

At the same time, some efforts have also been exerted to shift from open dumping to more environmentally sound disposal. The local governments of Marikina and Valenzuela in Metro Manila and San Fernando City in La Union have shifted to controlled dumping from open dumping. In the late 1980s, the shift to sanitary landfilling was also started with the establishment of the sanitary landfills in San Mateo, Rizal and in Carmona, Cavite (which was closed in April 1998 due to public opposition) to partly service needs of Metro Manila. Another one in Inayawan, Cebu servicing the needs of Cebu City was sent up by the city last year with funding support from the Overseas Economic Cooperation Fund (OECF) of Japan.

While these are all efforts in the right direction, they have not been enough to really solve the problem of solid waste. As noted in the Workshop Report on Micro and Small Enterprise Development in Municipal Solid Waste on Developing Countries (October 1986) "most cities/municipalities have approached waste management from a bureaucratic and technocratic angle only".

3.0 COMMUNITY MOBILIZATION FOR SOLID WASTE MANAGEMENT

This situation, together with growing environmental awareness, has led many communities and Non-Governmental Organizations (NGOs) in the Philippines to assume more direct responsibility for the management of their wastes. These community based management of solid waste includes a whole range of services from merely doing street sweeping to waste collection and storage, to waste reduction, composting, recycling and reuse of waste in many forms, to disposal and to livelihood activities.

1. Some communities take care of street sweeping and general clean up of their area.

2. Other communities, together with their NGO and local government partners, have assumed primary collection from the households.

    a) How is the collection done? Many actually undertake door to door collection. In communities being supported by an NGO, the Sagip Pasig Movement, a public address system is used to remind residents to bring out their waste when the collector comes. Other communities have set up common collection bins where residents can throw their waste. The

collection trucks then come based on a pre–agreed schedule to empty the common collection bins. The types of collection equipment generally used are handcarts, pushcarts and tricycles. This is the case in the Pasig Green Park Subdivision (a middle income neighborhood) where residents supported by an NGO, IRRREN, use tricycles for door to door collection.

b) Who does the collection? Sometimes, volunteers who do not get any pay at all can do collection from the community. Such is the case of the Zero Kalat sa Kaunlaran in Dagat Dagatan, Navotas, a resettlement area for squatters of the adjoining City of Manila. This project was started by an NGO, the Polymedic Medical Foundation Inc. The doctors realized that they could not hope to address the health needs of the people without doing something about the filthy environment they lived in. They thus conducting massive information campaign were able to mobilize community volunteers who were then trained by another NGO, the Recycling Movement of the Philippines Foundation Inc. In turn, each volunteer took care of informing and training 20 households about proper waste management.

In other instances, collectors or eco-aides are hired by the community or by the homeowners association (such is the experience of the homeowners in Filinvest I and in Blue Ridge, Quezon City). They may be hired or partly supported by the local government or they may also be collectors of the junk dealers.

For example, in Metro Manila, the Linis Ganda (an NGO) organized junk dealers in each local government into cooperatives. This was done to ensure more organized and systematic collection (someone is assigned to collect the recyclable and reusable materials from each barangay within a city or municipality). The eco-aides of these junk dealers are issued uniforms and proper identification cards so that they can collect from their assigned areas. At the same time, banding together as a cooperative enabled them to borrow money as operating capital from the Banks without any collateral.(This is provided in the Cooperative Development Act of the Philippines to encourage cooperatives in the country).

In Bustos, Bulacan, the street sweepers of the municipality were transformed into eco-aides. They still sweep the streets but while doing so, they also use pushcarts to collect the recyclable and reusable materials from each household.

A novel approach is also being done under a Donor-Beneficiary scheme presently operating in Makati City under the guidance of another NGO, the Ayala Foundation Inc. Rich homeowners living in highrise condominiums and urban poor communities are partnered. The condo-owners (actually their household maids) segregate their waste. Every night the urban poor communities then collect the recyclable and reusable materials, which they then sell to junk dealers. The truck of the Metro Manila Development Authority collects the residuals. This way the poor make money from the waste of the rich. This has been so successful that one community association has now set up their junk dealership and more condominiums are participating.

c) Where do they bring the collected waste? The collected waste is usually transported to communal collection points or transfer stations for secondary collection by the formal municipal collection system. Or, the collection equipment is brought to the main road to await the arrival of the collection trucks.

This highlights the importance of the loading and unloading procedures and the temporary storage facility. The primary collection equipment must also match those of the secondary collection vehicles. Double handling which happens when the collected wastes are dumped on the ground or to a big common container for transfer to a large transport vehicle should be avoided.

Attention should also be paid to the proper packaging and storage of the wastes. Some are using trailers that serves as temporary units where the contents of the handcarts are placed. Three to four of these trailers are then be hauled by a tractor or even a jeepney to the disposal area.

Those collecting segregated waste is usually brought to a common storage area where the recyclables are kept until a certain volume is reached. Then, they are sold to the junk dealers or to the factories. The biodegradable components are either used as animal feed or made into compost.

3. Seeing that more efficient collection alone will not solve the problem, many communities have come to realize that what Mr. Mustafa Tolba, the former Executive Director of the United Nations Development Program (UNDP) said

is true. "Waste is a resource in the wrong place at the wrong time. If used in the right way, waste becomes a resources like any other natural resources".

Many communities have thus started efforts to implement an integrated waste management program that includes waste avoidance, waste minimization, composting, recycling and reuse, efficient collection and an environmentally sound disposal. The key is to make this work is to segregate the waste into two or three types: biodegradable, non-biodegradable, that is, recyclable/reusable and residual wastes, which are to be collected for throwing away.

Segregation can be done at the temporary storage area. A good example of this was tried out in Quezon City. After collecting from the households, community collectors brought their full pushcarts to a big communal collection bin. Other eco-aides segregate the collected waste first to recover recyclable and reusable materials before throwing the residual waste into the bin for secondary collection by the local government trucks. The sales from the recovered materials were shared equally by the pushcart collectors and the eco–aides doing the segregation. There was therefore an economic incentive for all to collect more and also to recover more.

Segregation can also be done just before final disposal. This was tried in Malabon with the waste coming from the Malabon public market. One side of the disposal area was allocated for manual sorting by members of the Smokey Mountain Integrated Livelihood Enterprise Inc., (The members were former waste pickers in the infamous Smokey Mountain in Manila – the biggest open dumpsite in the Philippines). The recyclable and reusable waste is then set aside for sale to nearby junk dealers. Compostable wastes are treated with lactobacilli called "Happy Soil" and processed in rotating bins. The residual waste are then disposed in the designated area.

However, experience has shown that segregation and materials recovery are more efficient if done at source. In Dagat – Dagatan, Navotas and in Barangay San Antonio in Quezon City, households segregate their waste. The volunteers/eco–aides using pushcarts to collect the segregated waste pay the households for the recyclables and reusable and bring the collected materials to a common storage area where further sorting is done prior to storage. When they reach a particular volume, these recyclable and reusable materials are subsequently sold to junk dealers or to the factories. Sales go to the

cooperative, which the volunteers have organized. This way, everyone makes some money. The compostable waste is shredded and made into compost in the common composting area – a vacant lot which the local government has allowed the community to use (This lot used to serve as the community dumpsite with accumulated waste almost 5 feet high. On the day the project started, the community members cleaned this lot and all their surroundings, put all the waste in sacks that the local government then collected.). The compost produced is used in a communal garden where vegetables, herbal plants and seedlings are grown for use of any community member. The residual waste is set aside for collection by the local government trucks.

Exactly the same scheme is being practiced by Barangay Casili in Mandaue City, by Barangay New Era in Quezon City and the Municipality of Marilao in Bulacan. In Barangay Sun Valley in Parañaque, the compostable waste is also collected by eco–aides of the barangay and brought to the processing area where they are also treated with "Happy Soil" and processed in rotating bins. Some biodegradable waste is also processed through Vermi-composting, using earthworms. Once mature, the compost is ready to be sold.

Whether directly collected from the households or brought by the residents to a common area, there is always a need for a storage area where the recyclables are kept until they reach a particular volume. What is now gaining ground in the Philippines is to have this common storage area within a particular community or barangay (the smallest political unit in the country). Barangay New Era's storage is right beside the Barangay Hall.

We must recognize that undertaking an ecologically sound waste management program means changing attitudes, values and habits of people. In a sense, one could say that this is really all about behavioral change. People must stop looking at waste as useless things but rather as resources that could still be made useful. This can only be achieved with an extensive, intensive and sustained IEC. While the IEC is going on and some pilot projects in source segregation are in the initial phase of implementation, some secondary segregation prior to disposal can indeed be considered.

We have a rich experience of various waste reduction and materials recovery schemes in the Philippines. The collection of biodegradable wastes for use as animal feed ("kanin baboy") has been with us for sometime. Others such as

Bustos, Bulacan also encourage households not only to segregate their waste but actually do backyard composting. Thus, in Bustos , a compost pit is part of the land use of almost every household. In other areas, community members may bring their biodegradable wastes to a common composting area within the community (e.g. Blue Ridge, Filinvest I and Barangay New Era in Quezon City, Dagat – Dagatan, Navotas, Imus, Cavite). Some schools like Miriam College and Kamuning Elementary School are also practicing this. Compost produced is used for the garden needs of the community members, parks and center islands.

Other communities have gone beyond just making compost or soil conditioners from biodegradable waste. They transform these wastes into organic fertilizer. Wellknown is the initiative of Sta. Maria, Bulacan.

Biodegradable waste segregated at the source is shredded into smaller pieces. They are mixed with other organic waste from the community like pig manure and burned rice husks and treated with trichoderma, a fungus activator that hastens decomposition. Rock phosphate is also added to lessen the smell. They are then made into heaps and covered with used plastic sacks. Bamboo poles are stuck on the sides of the sacks to allow for more air to come in. After 15 days, the heaps are manually turned and covered again. After another 15 days, the organic fertilizer is ready for harvesting. They are then placed in a manual or mechanical shifter to separate the non–biodegradable materials which may have gotten mixed (like bottle caps, straws, plastic bags) and also the bigger particles which are then crushed by a hammer mill. After a few more days, the organic fertilizer is ready to be bagged and sold. The Bureau of Soils and Waste Management of the Department of Agriculture have tested this product called Kalikasan Organic Fertilizer. It has also been certified by the Fertilizer and Pesticide Authority to contain the minimum NPK requirements for it to consider an organic fertilizer. With a recovery of 50% and processing time of 40 – 45 days, what used to be a problem is transformed into money making venture.

This experience has inspired other local governments and communities like Naga City, Davao City, Mandaue City to adopt the same approach for their market waste. Davao City and Malolos, Bulacan also make organic fertilizer from the waste of their slaughterhouses.

4. Other communities have gone even further than that. They actually process some of these "resources" to develop new products as livelihood for the community members (aside from the manufacture of organic fertilizer). Some initiatives worth mentioning are:*(i)* vinegar and wine making from fruit and vegetable peeling; *(ii)* the making of recycled paper; *(iii)* the making of bags, hats, fans, decorative items, give away items and even Christmas lanterns from paper; *(iv)* floor wax and varnish from plastics; *(v)* twine, mats, belts, slippers and bags from soft plastic and straws *(vi)* soap making from used oil; *(vii)* flower ports, garbage bins, garden sets from old tires; *(viii)* piggy banks from used tin cans; and *(ix)* rags and floor mats from scrap fabrics. In Dagat Dagatan, Navotas, they are now seriously studying the possibility of making vinegar making into a business venture. In Muntinlupa City, they are making folders out of waste paper and selling these to various groups (including a USAID funded project) for use in meetings, seminars and conferences.

4.0 PROBLEMS ENCOUNTERED

These community-based initiatives have not been without any problems. Among the major issues identified are:

- Primary collection equipment sometime does not match the secondary collection. This makes collection and transfer too tedious and messy and adds to the health risk of those involved;
- The lack of knowledge and the cooperation of the community members. This lack of knowledge about the project and the exact role they can play has been identified to be among the reasons for the limited success or even the failure of some projects;
- The lack of linkage of community efforts with the local government. This is crucial especially if the community is dependents on the local authority for secondary collection and final disposal. Details like collection frequency and time of collection need to be threshed out. This has been a major sore point even among communities and NGOs in Metro Manila being assisted by the Metro Manila Development Authority and some LGUs;
- The lack of linkages with national government agencies. The Department of Agriculture can do much to promote the use of organic fertilizer. The Department of Trade and Industry, the Board of Investments and the Tariff Commission can implement policies, which support the use and sale of recycled materials. These and other agencies should also be tapped;

see that the solution is for their own benefit. Unless this happens, one cannot hope to get their full cooperation and the efforts may not be sustained. Going through highly participatory process will achieve this. It will also help build strong local ownership and commitment, which in turn will pave the way for the mobilization, of whatever local resources are available. After all, it is their project that they are implementing.

For example, Biñan, Laguna the fisher-folks realized that they were losing the fish in the river with all solid waste being dumped in the river and polluting it. To protect their livelihood, they actively cooperated with the other stakeholders to carry out a river rehabilitation project, which included proper waste management. They provided their own boats and manpower to physically clean up the river, plant bamboo on the riverbanks and conduct regular patrols.

One should also bear in mind that what is being established is not just a project but a process of enabling and empowering people to take direct responsibility or the management of their environment. At the same time, the active support of the local government must be sought. Rules and responsibilities of all the stakeholders must be clearly defined.

- While the project may be initiated by an NGO or by a donor, a local champion from within the community must be identified and developed. This will ensure that someone or some group within the community will really sustain the effort when the external facilitators/catalysts leave. In doing so, as much as possible, we should work with an existing people's organization (also referred to as community based organization) that is credible to the people rather than create a new one. This could be a mother's group, a religious or civic organization. Assistance for capability building of these local champions should also be provided.
- Attention must be paid to detailed and deliberate planning of what is to be implemented. Just how big an area can be covered? How many collectors should be mobilized? How often should collection be? What time is most convenient for all? What will be done if the government's collection trucks do not come on time or do not come at all? What engineering requirements are needed? These and many other details may make or break the project.
- Activities must be undertaken in phases and realistic targets set for each step. Starting with the DOABLES has proven very effective. If the project is too widespread or too complicated, then the risks will be higher. It is

easier to build on little successes. On the other hand, it may be difficult to try again once the initial effort fails.

- Incentive mechanisms must be put in place and operationalized. Community censure has been found to be a very effective means of pressurizing those who do not comply. Examples of this are placing the names of those household who do not comply in small blackboards in sari – sari stores all over the community (which is what Barangay Pitogo in Makati City did) or in billboards posted at the entrance of subdivisions. On the other hand, awards and recognition for those who do well will encourage those community members to do even better and will serve to challenge others. In some communities, they hold regular competition for the cleanest street, the most environmentally friendly house, and the most innovative use of recyclable materials like the best Christmas lantern, made out of waste. At the same time, some payments for the service must be seriously considered. The polluter pays principle must be operationalized.
- To really solve the problem of solid waste, an integrated waste management system must be developed and implemented. The root of the problem, the waste generation itself must be directly addressed.
- The community members must receive regular feedback on the progress of the project. This will help them make adjustments and improve the project "design". It will also encourage them to go on.

6.0 CONCLUSION

Community based activities have played a significant role in the delivery of waste management services over the years. They do much to remove the waste and clean up the area. They provide opportunities for employment and livelihood which can be considered as poverty alleviation measures. They augment the income of the residents and the community. They allow for services to be delivered at a lower cost to the community and even to the government. The local authorities do not have to collect and dispose big volume of wastes. This means savings in collection and transport cost as well as savings in landfill space for the government. These "freed–up" government funds can then be used for other social services and infrastructure needs of the community.

More importantly, in the process, a strong sense for a community spirit is created. Self-esteem is enhanced even among the collectors. Having seen that they can make things happen, this working together and helping each other may then extend

to other community issues (like childcare, education, health). Local ownership, which is critical to ensure sustainability, is also developed. They also minimize health-risk and adverse environmental impacts of indiscriminately dumped waste.

There is no doubt that communities (who generate the waste in the first place) play a key role in solid waste management. They can complement whatever the limited capabilities of local governments have. Many strategies to enable community participation have been tested and proven effective. Yet, community based management of solid waste has generally received little recognition. It is also worth noting that while there are many existing initiatives, very few have been scaled up. This is largely due to lack of government support. LGUs must go beyond merely tolerating such initiatives to seriously integrating this community based approach into the formal solid waste management system if we are to really make solid waste management effective. In fact, unless this cooperation is operationalized, we cannot hope to solve this urgent problem. And, we will not be able to ensure a better quality of life for our people, which in the final analysis is what governance is all about.

COMMUNITY WASTE MANAGEMENT: POSSIBILITIES AND PARTNERSHIP

by

Tariq Bin Yousuf

1.0 INTRODUCTION

A healthy life, cleaner city and better environment are the logical demands for the city dwellers as the municipalities are traditionally funded for solid waste services from municipal tax revenues. As the number of people in the city has grown, the financial burden incurred for this formal system of waste collection and disposal has grown even faster. Dumping sites in the city are more and more difficult to obtain and transportation of wastes out of the city is more and more expensive. As a consequence of fiscal constraints and rapid urban population growth, it is hard to ensure efficient and appropriate delivery of service to the entire population.

2.0 EMERGENCE OF COMMUNITY WASTE MANAGEMENT

Due to the absence of a regular municipal waste collection and non- availability of communal bins at suitable locations, wastes are found scattered on the streets creating aesthetic and health risks. This system has forced the local communities to establish their own informal waste collection services. The community managed house to house waste collection service is gaining momentum and gradually expanded into a major environmental movement.

3.0 COMMUNITY PARTICIPATION IN WASTE MANAGEMENT

More than 100 communities have begun this participatory program in Dhaka City. The system has already increased garbage collection coverage by 20 per cent, created approximately 400 jobs and proven to be appropriate for addressing local problems. This intervention positively contributes to environmental improvement,

employment for the urban poor, enhancement of social mobility and integrity as well as improvement of the quality of life of people.

4.0 NEED FOR GO-NGO PARTNERSHIP FOR SUSTAINABLE SOLUTION

The system is encouraging as people have willingness to pay for a cleaner neighborhood. But to make the program self-sustained, it is necessary to introduce recycling. DCC has the limited capacity and capability, financial resources and organizational structure. So DCC has to look for an economically sustainable solution for the management of wastes through GO-NGO partnership.

A recent development has been made on GO-NGO partnership between DCC and Waste Concern, a local NGO with the aim of making waste as resource integrating the informal sector initiatives. Initially DCC has agreed to set one ton capacity composting plant as a pilot program to judge the technical and financial viability.

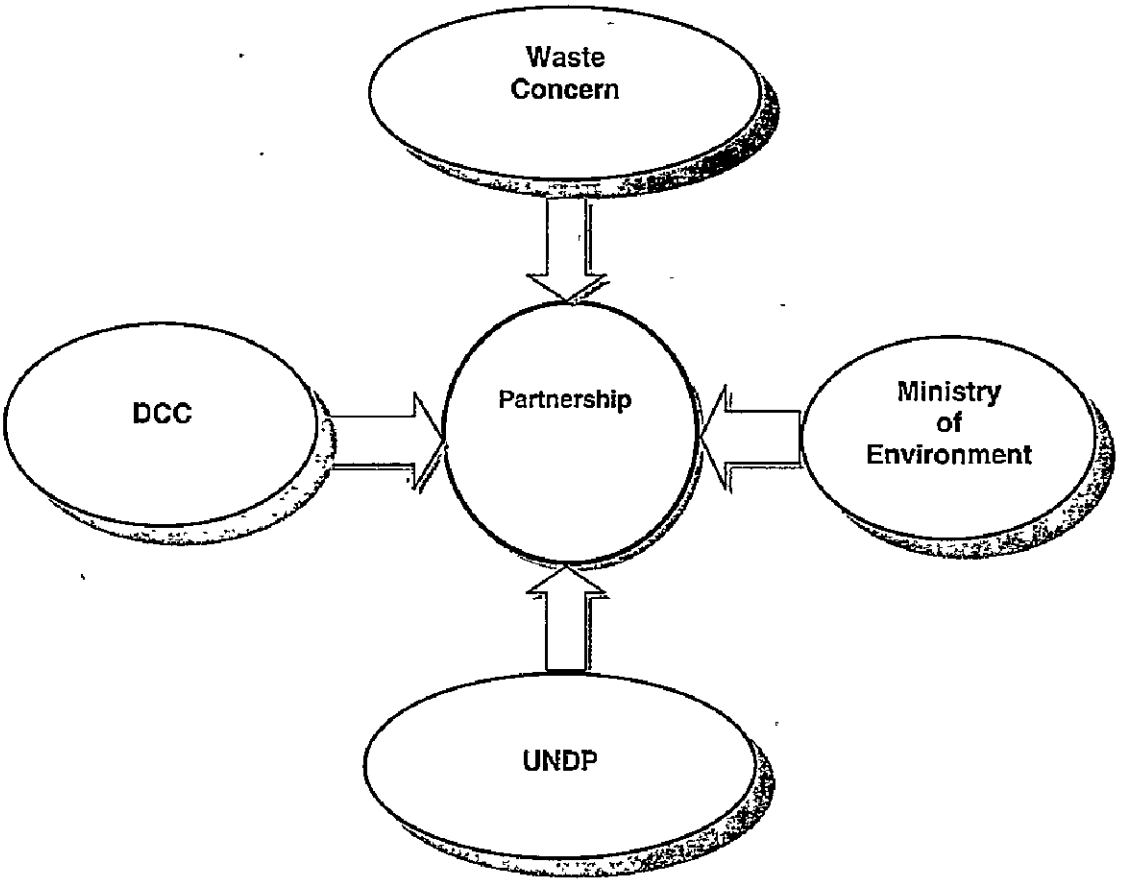

Figure IV.1 Partnership Model

5.0 BENEFITS OF PARTNERSHIP BASED WASTE MANAGEMENT

The possible benefits of the program as an outcome may be:

- Increases capacity of DCC in waste management
- Inspires DCC for scaling up community-private-public partnership
- Scope for dissemination of experiences to other communities
- To institute participatory development process
- Highlights the bridging role of NGOs in transferring indigenous technologies to municipalities and communities

6.0 PROBLEMS ENCOUNTERED IN IMPLEMENTING THE PROGRAM

The initial problems found to institutionalize the program are:

- Land scarcity in community
- Lack of interest in providing valuable lands for recycling
- Municipalities are less interested to put efforts in small scale recycling projects
- Chemical fertilizer is available to farmer, absence of wider market for organic composting
- Source separated waste is hardly to get from the households and poor understanding of the composting process by the community

7.0 SOLUTION NEEDED FOR MATERIALIZATION OF THE PROGRAM

Possible solutions to materialize the program are need to be addressed:

- As land is hardly to get for recycling so entrepreneur should take lease lands
- Recycling has both tangible and intangible benefits, the intangible benefits should be quantify for easy understanding of the importance by the municipality
- Financial incentive should be given to the workers for growing their interest
- Source separated waste is essential for good quality compost, so households are motivated accordingly
- The importance of organic fertilizer should be well demonstrated to the farmers

8:0 RECOMMENDATIONS FOR IMPROVEMENT OF THE PARTNERSHIP PROGRAM

Following recommendations are made for the improvement of solid waste management in Dhaka:

- Municipal ordinance/regulations on waste management should incorporate waste recycling as a disposal option
- Awareness in waste segregation, recycling, reuse should be raised through public campaign and media demonstration
- Community based organizations should be given support to organize cooperatives to smoothly handle small scale waste recycling
- Ministry of Agriculture should promote good market for organic compost
- Municipality should facilitate community based program rather than capital intensive hardware projects
- Partnership programs should be given priority for upholding technical know-how, managerial skills, and solving financial burdens.

HUMAN RESOURCES MANAGEMENT AND DEVELOPMENT CENTER'S SOLID WASTE MANAGEMENT PROGRAM

by

Saima Shinwari

1.0 INTRODUCTION TO HRMDC

Registered under the Societies Act XXI (1860), Human Resources Management and Development Center (HRMDC) is a not-for-profit non-government organization. It was established in March 1994 in Pakistan with the aim of contributing to human resources development in the North-West Frontier Province (NWFP) through training, dissemination of information, research and networking (with individuals and various partner agencies), and community development.

1.1 Objectives of HRMDC

The main objectives of HRMDC include the followings:

- To identify, develop and promote existing and potential local resource persons.
- To assess capacity building needs of existing and potential partners and develop needs based packages.
- To develop and test innovative inter-sectoral community development models using indigenous values.
- To facilitate community organizations in taking over the implementation of developed models and in establishing linkages with concerned organizations.
- To strengthen the working relationships between Non-Government Organizations (NGOs), Community Based Organizations (CBOs),

Government Departments and Organizations (GOs), and key resource persons.

- To enhance understanding of core human resources related issues by conducting regular research on such issues.

1.2 HRMDC's On-Going Programs

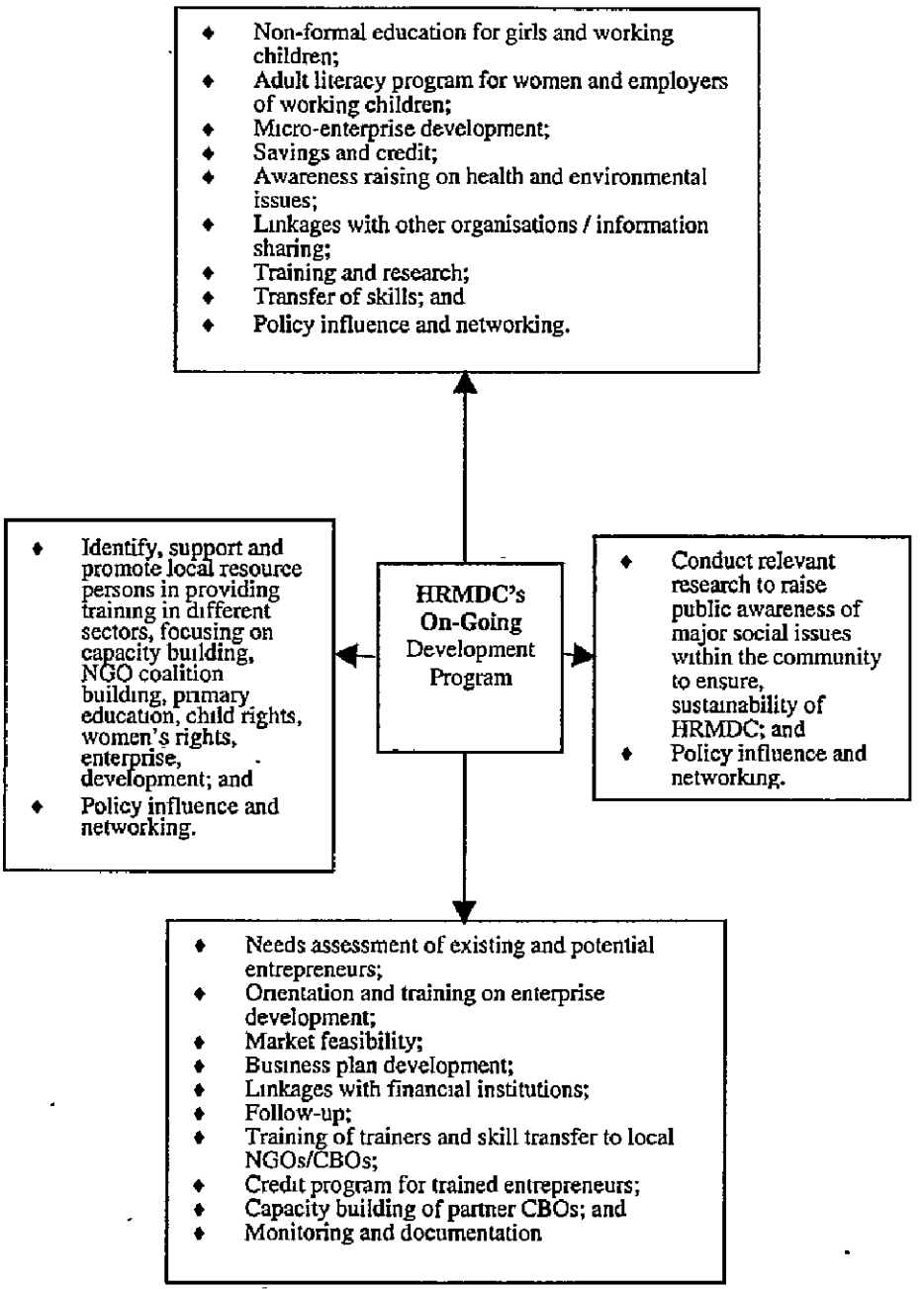
Non-formal education for girls and working children;
Adult literacy program for women and employers of working children;
Micro-enterprise development;
Savings and credit;
Awareness raising on health and environmental issues;
Linkages with other organisations / information sharing;
Training and research;
Transfer of skills; and
Policy influence and networking.
Identify, support and promote local resource persons in providing training in different sectors, focusing on capacity building, NGO coalition building, primary education, child rights, women's rights, enterprise, development; and
Policy influence and networking.
HRMDC's On-Going Development Program
Conduct relevant research to raise public awareness of major social issues within the community to ensure, sustainability of HRMDC; and
Policy influence and networking.
Needs assessment of existing and potential entrepreneurs;
Orientation and training on enterprise development;
Market feasibility;
Business plan development;
Linkages with financial institutions;
Follow-up;
Training of trainers and skill transfer to local NGOs/CBOs;
Credit program for trained entrepreneurs;
Capacity building of partner CBOs; and
Monitoring and documentation

Figure IV.2 HRMDC's Ongoing Programs

2.0 BACKGROUND OF HRMDC'S SOLID WASTE MANAGEMENT PROGRAM

HRMDC initiated a pilot program on effective urban waste management to evaluate the solid waste problem and explore the ways of supporting and modernizing the indigenous waste collection and recycling networks. The program is designed to enhance the literacy level of scavengers, provide health education to women in the focus area, and build the capacity of relevant organizations.

HRMDC initiated its pilot program on SWM in Tehkal Payan in 1994. Tehkal Payan is a semi-urban slum located west of Peshawar City. The total population of the area is around 20,000 out of which approximately 20% are Afghan refugees living in rented houses.

Tehkal Payan was selected as the pilot site as it met HRMDC's criteria for area selection. The criteria to be met included:

- A majority of the inhabitants should be Pakistani.
- Preferably the area shall not be touched by foreign donor agencies.
- The target group should belong to the low and middle level income groups.
- The area should be a semi-urban or an urban community of Peshawar.
- It should be accessible to compost farm and agricultural land.
- Secondary data of the area should be easily available through line departments.
- The area should not be volatile.
- The community should be willing to support the program.

Initially, the main thrust of the program was on solid waste management and related social issues. However, the program has now grown into an Integrated Urban Development Program encompassing a number of socio-economic issues relevant to the area. These include income generation for women, skill development, savings and credit, and girl's, women's and working children's education. The community actively participated in the growth process, and is now successfully running the program without any external financial support.

3.0 OBJECTIVES OF HRMDC's SOLID WASTE MANAGEMENT PROGRAM

The overall purpose of the program is to contribute to the improvement of solid waste management and the efficient use of solid waste values in the Province. The objectives are as follows:

- To identify, improve and support the existing solid waste collection and recycling networks in the selected streets;
- To enhance awareness in the local communities about environmental degradation caused by poor waste management;
- To contribute to the capacity building of relevant governmental organizations involved in solid waste management;
- To improve the work environment of the selected waste collectors and enhance their socio-economic and literacy levels;
- To provide an opportunity to women and working children to develop their existing skills and learn new ones;
- To initiate marketing and income generation activities for women in the community; and
- To enhance the literacy levels of women in the community.

4.0 HRMDC'S APPROACH

To achieve the objectives HRMDC adopted an integrated approach, including community participation, primary healthcare for women, improving the socio-economic and literacy levels of waste collectors, compost making and marketing, and capacity building of concerned government and non-government departments.

An integrated approach was adopted to involve all the stakeholders so as to ensure the program's sustainability upon its transfer. The Solid Waste Management Program was implemented according to the following implementation cycle.

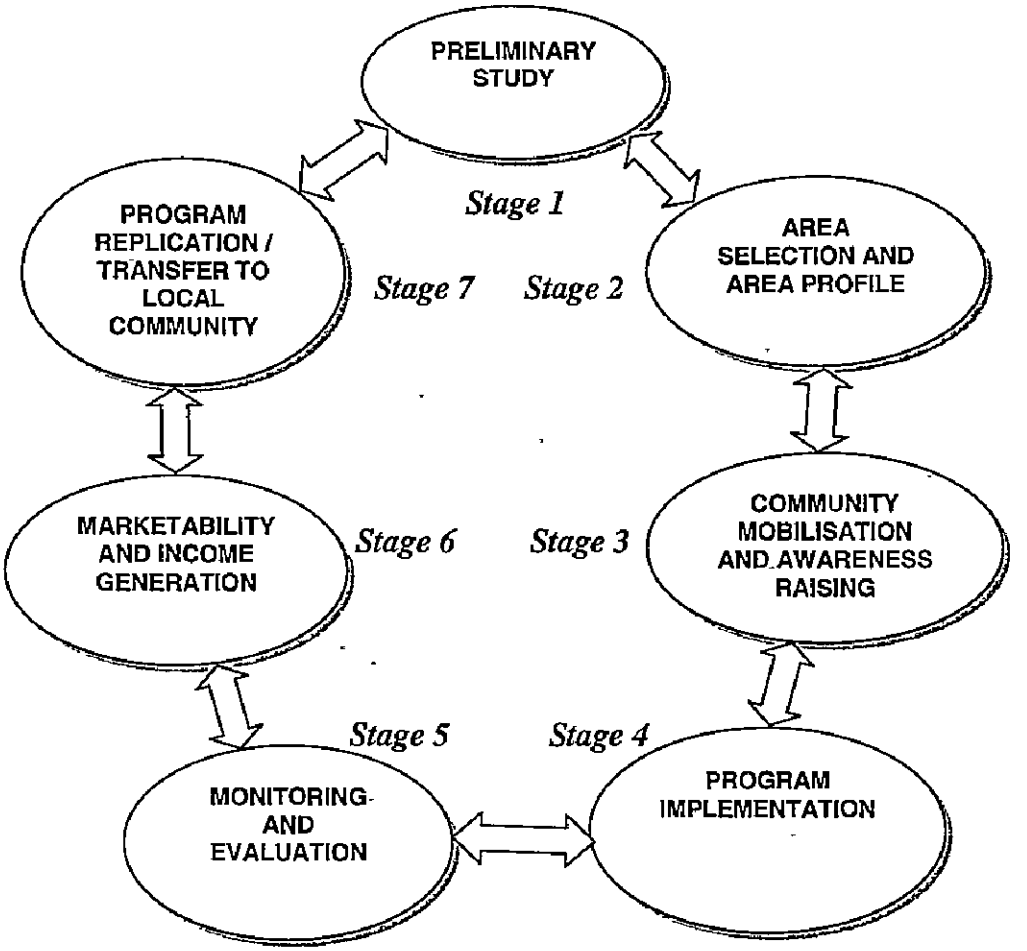

Figure IV.3 Solid Waste Management Implementation Cycle

The cycle of the pilot study in Tehkal Payan, began in 1994 and is continuing today in the form of an integrated urban development program. The stages of the program's development through implementation cycle are as follows:

Stages 1, 2 and 3

Tehkal Payan was identified as the project area. A meeting was held with the community elders to familiarize them with the concept, and further meetings were then held with all members of the community. A *safai* (cleanliness) day was held to raise awareness, and the municipal corporation's administrator participated in the event. Socio-economic data of the selected streets was collected and existing trends of waste disposal were assessed.

Stages 4, 5 and 6

Once households had been sufficiently motivated, the members were given two garbage bags, dark blue for organic waste and white for non-organic waste. Most of the waste collected was organic as the inorganic junk was kept for its resale value by the household members themselves. Waste collectors collected the bags twice weekly and sent to the compost farm, which is 10 km from Tehkal. Waste was further sorted there by the waste collectors to separate saleable junk (bottles, plastic, paper, tin, etc.) and ensure that only non-organic waste was sold or disposed of in municipal dumps. A *hujra* committee of household members was formed which collected the service charge of Rs. 15 per month. The committee kept all accounts of receipts and expenditure.

HRMDC adopted the pit composting method, which is a semi-aerobic method of converting organic waste into compost/natural fertilizer. The method is also a slight modification of the traditional way of composting in Pakistan.

The organic waste is stored in pits and left covered for four to six weeks until the composting is complete. Originally, nine pits were dug, each being four feet deep, and 10 x 4 feet in length and width. Due to excessive rainfall, the pits were lined with brick as a means of support. This resulted in difficulties in turning the compost, and four new pits, each four feet deep and 10 by 10 feet in length and width were dug. A thatched roof was added to control excessive rain and to provide protection from the sun to the waste collectors.

The compost was introduced and marketed to Peshawar Development Authority, schools, colleges and samples were sent to the United Nations Development Program, Swiss NGO Program Office, Sustainable Development Policy Institute, and Tarnab Farm and Nursery in Peshawar.

The ready compost was packed in one kg bags and sold for Rs. 15 ($.04) per kg. The income from the sale, which in 1997 amounted to Rs. 3,400 ($85) was ploughed back into the program.

The social organizer visited the area three times a week to monitor the program activities and provide support.

Stage 7

Male and female social organizers held weekly meetings with the community to discuss progress, to motivate and to facilitate the resolution of any problems. In September 1997 the Program was handed over to the CBO. The CBO formalized a contract with the participating households and increased the service fee to between Rs. 10 to Rs. 20 per month. The CBO has organized regular monthly meetings for resolving problems and liaising with town municipal committee members. Initially, there was no designated municipal rubbish dumpsite in Tehkal. As a result of the support, information and empowerment provided by HRMDC's program, the community now actively lobbies with the municipality to carry out drain-cleaning and secondary collection. HRMDC's social organizers still visit the area twice a week to monitor the program and provide support.

In an effort to assist in replicating the SWMP, several orientation events have been organized for NGOs/GOs interested in replicating this program to provide an overview and an understanding of the implementation cycle.

After the immediate concerns of waste management were addressed, the community was able to discuss secondary benefits of the SWMP such as personal and household hygiene. Such discussion led to the community articulating their needs and discussing possibilities of initiating activities such as micro-enterprise and income generation, skill enhancement, literacy development, saving and credit further programs need for supplementary services that flow on from SWM. A diagram showing the up scaling and growth of the Program is presented in Figure IV. 4.

5.0 ACHIEVEMENTS OF HRMDC'S SOLID WASTE MANAGEMENT PROGRAM

Eight NGOs and CBOs throughout Pakistan have, to date, replicated HRMDC's SWMP. Organizations' feedback is that the model is cost-effective, easily replicated and easily understood. The Program, as employed by HRMDC, has achieved the following:

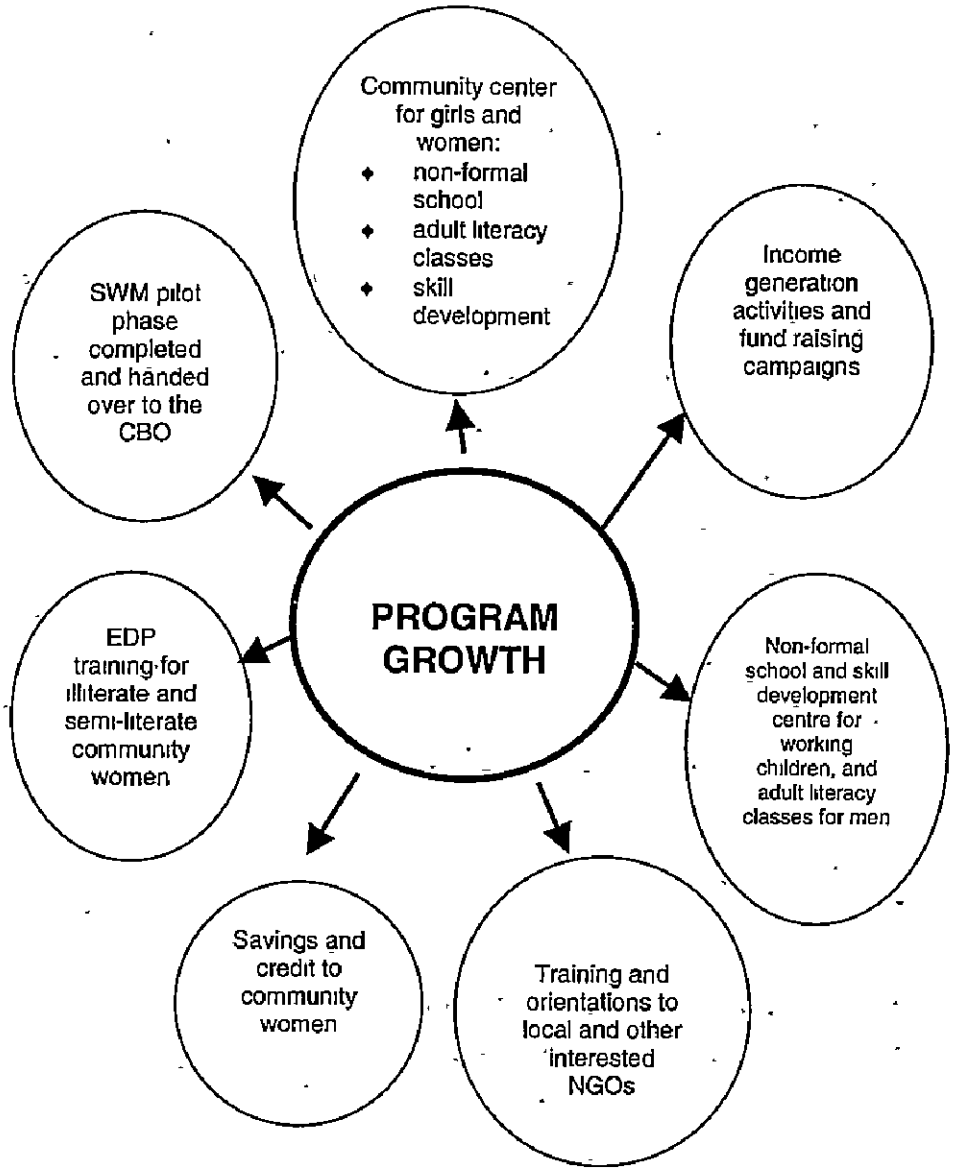
Community center for girls and women:
non-formal school
adult literacy classes
skill development
SWM pilot phase completed and handed over to the CBO
Income generation activities and fund raising campaigns
PROGRAM GROWTH
EDP training for illiterate and semi-literate community women
Non-formal school and skill development centre for working children, and adult literacy classes for men
Savings and credit to community women
Training and orientations to local and other interested NGOs

Figure IV.4 Diagram of Scaling up and Growth of Program

- Active community participation and ownership of the Program
- The overall waste disposal in the selected area has improved
- Greater awareness of health and environmental issues among women
- Improvement of literacy and income levels of the working children
- Non-formal education for girls and the community's acceptance of the need for female education
- Formation of a community based organization (CBO)

- Regular meetings with the women
- Establishment of two women's skill centers
- Transfer of skills
- Reduction in the use of plastic bags
- Recycling of organic and inorganic waste
- Improvement in the technical aspects of composting
- Replication of the program in other areas of the country through orientation training for interested organizations
- Cost effectiveness of waste disposal

6.0 CONSTRAINTS

Constraints to the program became more apparent after it was transferred to the Thekal Payan CBO. Constraints were economic, cultural/social and technical in nature. They include:

- Collection of service charges from the households on a regular basis was difficult, as the poor could not always afford the fee. The Municipal Corporation of Peshawar not providing the collection service, which the community had already paid for, further compounded this. Due to this, the community felt that they were paying double for half of the service.
- On average the CBO collects Rs. 6 per household per month which is barely sufficient to pay the waste pickers' wages. The only alternative source of income is recycling and the small scale of the project limits sale of compost, and the potential for this.
- There is a lack of adequate financial support to ensure the Program's extension and expansion.
- The extremely conservative social and cultural norms in the focus area have made it difficult for HRMDC to initiate a women's organization that would be able to support women's activities.
- Due to the CBO members' involvement in other activities, it is difficult to organize regular meetings with them for future planning of the Program.
- There is limited information and a lack of technical support in the compost site development and composting techniques.

7.0 RECOMMENDATIONS AND SUPPORT MECHANISMS NEEDED

While HRMDC is satisfied with the SWM model developed, there are further considerations-encompassing financial, technical and social structures of the area-which must be taken into account to ensure the program's long term sustainability.

- The sustainability of the program lies either in convincing the community of the benefits of working together and meeting the expenses through user fees or increasing the scale of the project, and profitability of the composting, in order to meet the capital, operational and depreciation costs.
- Too much external support during the early phases may prejudice attempts to turn the system into a self-sustaining service, by allowing the running costs to rise beyond the community's reach. This hampers replication, and major operational changes have to be introduced after handing over.
- Secondary activities can help to provide impetus to a project even if primary activities have to be suspended or slowed down.
- NGOs play an important role in initiating and demonstrating new concepts, providing technical knowledge, linkages with formal sectors, and training of others interested in replicating such concepts. NGOs can impart skills, share models, knowledge, information based on their experiences.
- There is a need for research on low cost composting in Pakistan. This program had to go through a major learning experience for composting and had to rely on information from abroad.
- There is a need to study how the two operations of composting and primary collection could be transformed into micro-enterprises, and how to facilitate this by providing training, technical support, and equipment, as well as to evaluate the market for sale of compost.
- It is recommended that the local social and cultural norms and values of a community be considered before undertaking any developmental activity in it.
- The community accepted HRMDC's SWM Program because it employed indigenous values and acknowledged local customs particularly to that community.

For the program to be sustained as a micro-enterprise, an economy of scale needs to be reached. The income generated from the Tehkal Payan area is not enough to sustain the program as a micro-enterprise. Different elements of the program, such as compost selling, development of ecological waste bags, and the selling of inorganic matter such as tins and plastic, may be run as micro-enterprises on their own.

SOLID WASTE MANAGEMENT IN KHULNA CITY AND A CASE STUDY OF A CBO: AMADER PARIBARTAN

by

Md. Ghulam Murtaza
and
Dr. Mohammad Abdur Rahman

1.0 INTRODUCTION

South Asian countries share many common problems related to the management of solid waste generated from their cities. Like many other cities in the South Asian countries, Khulna, the third largest city of Bangladesh, is also experiencing severe problems of managing its solid waste.

Ever-increasing population and economic activities, uncontrolled urbanization, proliferation of slums and squatter settlements are the main factors responsible for the generation of huge amount of solid wastes in the city. Considering per capita generation rate of 0.2kg/day/household it can be estimated that about 170 tons of solid waste is generated in the city per day. Only about 72 metric tons of the generated waste is finally dumped at Rajbandh, the only final dumping ground situated at the outskirt of Khulna city (KCC, 1998). This clearly indicates that the ability of Khulna City Corporation (KCC) of managing solid wastes of the city has reached its ultimate. A recently concluded study sponsored by USAID suggests that KCC has neither sufficient numbers of dustbins nor these bins are equitably distributed throughout the city. This suggests the possibility of a significant amount of waste being dumped haphazardly throughout the city.

Recently quite a good number of Non-Government Organizations (NGOs)/Community Based Organizations (CBOs) are getting involved in waste management activities at community level. Their participation has significantly improved the environmental situations of the areas in which they are working.

The urban solid waste management has been considered as one of the most serious environmental problems. The municipal authorities of these countries are not financially, institutionally and technically well-equipped to deal with these environmental problems. As a result, the activities related to the urban solid waste management have not been effectively addressed by the local level organizations. Recently, it is being noticed that in order to supplement and assist the activities of the municipal authorities, the local bodies, a number of NGOs, CBOs and private organizations have come forward to collect and dispose the household level solid wastes. In addition to the activities of Khulna City Corporation relating to solid waste management, presently a number of NGOs and CBOs are working in this field of provision of urban services to the city dwellers. In the whole process of solid waste management at the city level, the involvement of the community is critical since the community people are being affected seriously by their indiscriminate disposal of waste, and through their active participation the problems related of solid waste management can be improved.

Urban solid waste management is one of the most essential urban services required for ensuring healthy urban environment by reducing associated environmental and public health risk. Both software and hardware aspects of waste management have been addressed from both service recipients and providers' sides. Waste generation and disposal practices by different types of enterprises and the problems which are being faced by them in disposing off wastes are the major issues addressed in this paper from the service recipients' side. On the other hand, institutional, financial and organizational issues related to service providers such as KCC and NGOs/CBOs are also addressed in the paper.

2.0 METHODOLOGY

All reports of the research works in solid waste management related fields, so far conducted in Bangladesh Institute of Technology (BIT), Khulna and Khulna University have been reviewed. Information has been gathered from various project reports of Khulna City Corporation (KCC) and Khulna Development Authority (KDA). All available secondary sources of information have also been consulted. A

brief field survey was also conducted to get views of the service recipients. To get service providers' point of view, structured interviews were conducted among the officials of Conservancy Department of KCC and NGOs / CBOs involved in waste management activities of the city.

3.0 REVIEW OF LITERATURE

Ahmed (1998) reported that production of biogas is one of the major uses of solid waste. In this thesis paper, the author explores the possibilities of expanding biogas technology in the rural areas of Bangladesh. Community participation has been identified as one of the major impetus in expanding this technology.

Chakraborty (1998) attempted to identify existing solid waste management practices, its drawbacks and potentials for improvements in the study area. The author tried to address the issues from both KCC's and city dwellers' side. A set of recommendations has been suggested to improve the present situation.

Hossain (1998) gave an idea about the existing source and quantity of waste generated in the KCC area. Information regarding waste handling capacity of KCC is also provided. Finally the author has drawn up some recommendations for improvements in both waste collection and disposal operations carried out by KCC.

Keya and Khanom (1996) have studied the present solid waste collection and disposal system of Khulna City with the objectives to collect the necessary data to extend the existing system of solid waste disposal in future in order to justify whether the existing collection, treatment and disposal system is adequate for the city area and to improve the existing system. The authors have made various suggestions for improvement of both collection and disposal systems of solid waste for Khulna city.

Khan *et al.* (1993) attempted to generate a transportation model for efficient and economic management of solid waste generated in KCC. A linear programming model has been developed in this study. This model has been tested and found to be economically more efficient than the existing system.

Parveen (1996) attempted to evaluate the functional and economic efficiencies of existing biogas plants in Khulna City. Besides, it also tried to identify problems presently being faced by the plants. Finally the author tried to find out the problems and prospects of dissemination of biogas technology.

Muna (1997) tried to compare effectiveness of solid waste management between a KCC operated and Subashti (private enterprise) operated areas. She also tried to compare levels of satisfaction between the inhabitants of the mentioned areas.

Rahim and Sarker (1998) noted that uncontrolled tipping in the depressions around the city area is the only method of solid waste disposal practiced so far by KCC. This option of solid waste disposal has the risk of polluting ground water as subsoil of landfill sites have been found to be highly permeable. A less permeable liner for the landfill sites has been tried to find out. Commercially available sodium bentonite compacted with locally available sand having various fineness contents has been tested to find out a less permeable liner for the landfill sites.

Urban and Rural Planning Discipline (1999) with the assistance of USAID has completed a project and prepared "Environmental Mapping and Workbook for Khulna City" which includes a lot of information on various parameters of Khulna city including that on solid waste.

Ferdous (1999) for partial fulfillment for the degree of Bachelor of Urban and Rural Planning in Khulna University has prepared a Project Thesis on solid waste management in Nirala residential area.

With the financial and limited technical assistance from RUDO through USAID in Dhaka, preparation of Environmental Risk Management Plan is nearing completion through the collaborative efforts of the staff members of different disciplines of Khulna University, Khulna City Corporation, Bangladesh Institute of Technology, Khulna, different NGOs based at Khulna and some other Organizations (Anon, 2000).

4.0 STATUS OF SOLID WASTE MANAGEMENT IN KHULNA CITY

4.1 Sources of Solid Waste

Households are the major sources of waste generation in the city. Hotels and restaurants wholesale and retail markets for perishable goods, vegetables, fishes and meats generate waste of significant amount. Though insignificant in amount, hospitals, clinics and diagnostic centers generate different types of clinical wastes, some of which are very hazardous in nature. Formal and informal industries,

commercial and institutional establishments generate waste of significant amount. Besides, slaughterhouses also generate significant amount of solid waste everyday. Table IV.2 shows an estimate of waste generated from some of the major sources in Khulna City.

Table IV.2 Estimate of Waste Generated from Major Sources*

Sl. No.	Sources	Unit	Amount
1	Household	Kg/cap/day	0.2
2	Katcha bazars	Kg/day	40-200
3	Slaughterhouses	Tones/day	1-3.5
4	Fish meal industries	Kg/day	50-100
5	Hotels and Restaurants	Kg/day	30-120

**Field Survey by members of the Environmental Risk Management Plan (ERMP) study team for Khulna City in 1999.*

4.2 Characteristics of Solid Waste

Detailed stream analysis of the generated solid waste has never been conducted for Khulna City. Preliminary survey conducted for this project suggests that 70 to 80 per cent of the generated waste in the city is organic in nature and hence easily biodegradable. Remaining 30-20 per cent is inorganic and non-biodegradable.

4.3 Generation of Solid Waste

There is no reliable estimate about the amount of solid waste generated in the city. It has been estimated that everyday about 380 metric tons of solid wastes are generated from Khulna city having population of 8.5 lac (Aqua-Sheltech, 1998). However, this seems to be an over estimate. Considering per capita generation of 0.2kg/day a more reliable estimate by the group suggests that total 170 metric tons of waste is generated in Khulna City everyday. This tremendous volume of solid waste is generated from domestic, industrial, commercial, institutional and other (e.g., slaughterhouse) sources. The highest quantity of solid waste is generated in winter season and the lowest in wet season. The major constituents of the wastes are organic in nature. Conservancy Department of KCC with its limited staff strength and budgetary allocation can manage only 80 metric tons of this waste. Another 60 metric tons of wastes are managed by the CBOs and NGOs. CBOs and NGOs collect waste from door to door and accumulate either in secondary

collection points or in roadside dustbins installed by KCC. From specific collection points, wastes are collected and transported by KCC to the final disposal site located at Rajbandh, some 8 km from the city center. Thus only 37 % of the total generated wastes in Khulna City are properly managed. Rest of the volume of unmanaged wastes ultimately finds their way into surface drains, derelict pond and in low-lying areas for land reclamation. In the rainy season, these wastes particularly vegetable matters and similar organic wastes after decomposition spread obnoxious odor and deteriorate the hygienic condition of the living environment. Furthermore, leaching out from the decomposed wastes often contaminate both surface and sub-surface water quality. Apart from these, non-degradable solid waste such as polythene creates blocking of the surface drains and cause drainage congestion problem.

4.4 Institutions Involved in Solid Waste Management and their Roles

Conservancy Department of Khulna City Corporation is responsible for the collection of removals from the dustbins and disposal of refuse arising in the KCC area, including removal of refuse from all public streets, public latrines, urinals, drains and all buildings and land vested in the city area. KCC is also responsible for providing dustbins at points along the road, and other waste receptacles. It has to collect conservancy tax and manage funds derived from the tax paid by the city dwellers. Autonomous bodies such as various nationalized Jute Mills, Khulna News Print Mills, Khulna Hard Board Mills, Khulna University, Bangladesh Institute of Technology, etc., are some of the many autonomous bodies which are responsible for providing dustbins on their respective premises.

In recent years in order to supplement the activities of KCC, a number of NGOs and CBOs have come forward in managing solid waste in Khulna City. Notable mentions may be made of Rustic, Prodipan, Shabolombi, etc., NGOs and CBOs such as Amader Paribartan and so on. The scope of work and their area coverage is rather limited. However, the main activities include collection of waste from households to secondary collection points selected by KCC, construction of few secondary collection points, e.g., Ward No. 12 and build awareness among the city dwellers regarding proper disposal of household wastes.

4.5 Solid Waste Disposal Practices

In case of the localities where NGOs / CBOs are involved in waste management, survey findings suggest that in 64 per cent cases wastes are collected from

individual households. In 24 per cent cases wastes are disposed off in the KCC provided dustbins. Roadside dumping and dumping in the open fields both constitute 4 per cent each. However, where this service is absent, 60 per cent of the generated wastes are dumped in the KCC provided bins. Roadside dumping and dumping in the open fields constitute 12 and 20 per cent respectively. Crude dumping is the only option practiced so far by KCC for the final disposal of waste generated in the city. Though Rajbandh, a 25 acre site situated about 9 km from the city, is the only officially designated dumping site, wastes are often seen dumped off in many of the low-lying areas of the city.

4.6 Role of Khulna City Corporation in Solid Waste Disposal

KCC is the only public sector organization responsible for solid waste management in the city. This organization's responsibilities are clearly defined in the Paurashava and Municipal Corporation Law Manual of 1989. Being improperly staffed and financially handicapped, KCC has been struggling hard to ensure minimum level of service to the city dwellers. It may, however, be mentioned here that as per regulatory arrangements, KCC is responsible for collection of solid waste from the dustbins to secondary collection point and finally dispose the same to the final disposal site at Rajbandh.

4.7 Infrastructure of KCC for Solid Waste Management

Manpower: KCC has a conservancy section, headed by a Conservancy Officer (CO). Total number of conservancy staff is 547. Detailed break down of the conservancy section is shown in Table IV.3

Table IV.3 Details of Manpower of the Conservancy Department of Khulna City Corporation (KCC, 1999)

Sl.No.	Staff Position in the Conservancy Department	Number
1	Conservancy Officer (CO)	01
2	Assistant Conservancy Officer (ACO)	02
3	Conservancy Supervising Inspector (CSI)	02
4	Conservancy Supervisor (CS)	23
5	M.L.S.S.	02
6	Truck Driver	10
7	Truck Helper	29

Sl.No.	Staff Position in the Conservancy Department	Number
8	Drain Cleaner	332
9	Road Sweeper	70
10	Wheelbarrow driver	04
11	Spray-man	27
12	Fogger Machine Operator	05
13	Miscellaneous (Dog killer, general, etc.)	48
	Total	547

Vehicles and equipment: Khulna City Corporation has to shoulder a very big responsibility of conservancy services in the city. But the vehicles and equipment, which the Conservancy Department possesses, are far from adequate. A detailed list of KCC's vehicles and equipment is shown in Table IV.4.

Table IV.4 List of Vehicles and Equipment Used for Conservancy Operation by KCC (KCC, 1998).

Type of Vehicles/Equipment	Number of Item	Capacity
Big Truck	07	5.0 tons
Medium Truck	02	3.0 tons
Small Truck	02	1.5 tons
Tractor	02	2.0 tons
Wheel Barrow	65	50 kg
Rickshaw Van	62	500 kg
Fogger Machine	14	-
Dislodging Vacuum Tanker with Tractor	01	2000 gal

Financial Aspects: Conservancy tax is 4 per cent of the total amount of holding tax. KCC collected Taka 2.7 million from the city dwellers as conservancy tax in 1997-98. However, total expenditure to provide conservancy services for the year 1997-1998 was Taka 17.82 million. It indicates that the Corporation has to depend heavily on Government's grant to run its conservancy operation. The amount being spent is also insufficient to provide a reasonable level of service to the city dwellers. KCC is responsible for collecting wastes from the primary collection points under the purview of existing legislation. As the number of dustbins in KCC area is not sufficient and as the bins are placed at a long distance, a huge amount of wastes from the households does not reach the bins, rather they are thrown in low-lying area/ditch, drains, and also scattered here and there.

Dustbin network and their use: KCC has 1200 dustbins within its command area. Of them 400 are covered, 700 open and the rest 100 are ring type dustbins the distribution of which are taken from *Environmental Mapping and Workbook Report Map* No. 1. It has also been revealed by the household survey that only about 36 per cent of the households have their dustbins within 50 meters of their houses. About 30 per cent of the households have their dustbins within 50 to 100 meters which is followed by 8 per cent having distance 101 to 200 meters. Furthermore, about 16.5 per cent of the dustbins are located more than 500 meters away from the households.

Disposal of solid waste is a real problem for the city dwellers due to its unsatisfactory management system. It has been found by household survey conducted by the study team that 30.4 per cent of the households dispose of their garbage in dustbins, 11.2 per cent in drains, 33.4 per cent of the households throw waste into nearby low land/ditch, 7.7 per cent throw waste elsewhere. Lately, local NGOs have come up with a program on payment of door to door collection of household solid waste. About 17.3 per cent families of the city are presently covered under the new system. Table IV.5 shows the present practice of solid waste disposal by the households of Khulna City.

Table IV.5 Place of Waste Disposal

Dustbin	Drain	Low Lying Land/Ditch	Others	NGOs/CBOs	% Total House-hold
30.4	11.2	33.4	7.7	17.3	100

Source: *Household survey conducted during preparation of Environmental Mapping and Workbook for Khulna City, 1999*

It has also been found from the results of socio-economic survey that 90.4 per cent of the households dispose of their waste everyday and 4.9 per cent of the households once in week. Notably it can be observed that about 28 per cent of the households in ward no. 7 dispose of their solid waste once in a week, which is followed by 15.3 per cent of the households in ward no. 19.

4.8 Constraints Identified in KCC's Solid Waste Management

The following constraints have been identified to be hindering efficient solid management by KCC:

- Poor revenue collection for conservancy purposes.
- Lack of adequate financial support for strengthening the activities of the conservancy sector.
- Lack of adequate and trained manpower and equipment.
- Lack of adequate number and capacities of the dustbins.
- Improper placing of the bins.
- Unhygienic waste handling practices by the conservancy staffs.
- Lack of adequate motivational activities of the city dwellers for proper disposal of solid wastes.

4.9 Role of NGOs/CBOs in Solid Waste Management

Due to the inherent limitations of KCC in handling solid waste, as has already been pointed out, in recent years both NGOs and CBOs are getting involved in the solid waste management in Khulna City. Mainly they are trying to bridge the gap between waste generation sources and primary collection points of KCC, which has not been properly addressed so far. Some of them (e.g. Prodipan) have also constructed some secondary collection points for KCC's truck drivers to collect waste very easily. Besides, NGOs /CBOs are also involved in awareness building among the city dwellers regarding proper management of solid wastes. These organizations are carrying out their activities with the support from the Conservancy Department of KCC. Some of these organizations are offering this service in exchange of some service charges. Table III.6 shows the list of the NGOs/CBOs and their activities in City Corporation area.

Table IV.6 NGOs and CBOs and their Waste Management Related Activities in Khulna City Corporation Area

Sl. No.	Name of the NGOs / CBOs	Work Area (Ward)	Major Activities Conducted	Nature of Support Obtained from KCC/Other NGOs
01	Prodipan	6, 12, 17, 24, 27, 28	House to house waste collection, drain cleaning, sanitation and construction of secondary disposal points	Close coordination with KCC, MOU has been signed
02.	Muktir Alo	23	Waste Collection	Van support from KCC
03	Shabolombi	10, 11	Waste Collection	Van support from KCC
04.	Amader Paribartan	24 (part)	Waste Collection	
05.	RUSTIC	16, 17, 18 (partly)	Waste Collection	Van support from KCC, van and also other logistic support from Prodipan
06.	Nabarun Shangsad	24 (partly)	Waste Collection	Van and other logistic support from Prodipan

It is thus seen that out of 31 wards of KCC, NGOs and CBOs are currently engaged in collection of wastes from ten wards (viz. ward nos. 6, 10, 11, 12, 16, 17, 23, 24, 27, and 28, and only partly from ward no.18).

People are asking for the legal basis of the service charges being charged by some of the organizations. After paying the holding tax (where conservancy is included) many people are reluctant to pay extra money for conservancy services. In the slums, lack of awareness among the slum dwellers and lack of necessary infrastructure make waste management task very difficult.

4.10 A Case Study of Amader Paribartan : A CBO Involved Solid Waste Management

4.10.1 Establishment

Amader Paribartan, a CBO, means our change in social and economic development context. Under the initiatives of some local enthusiastic people, Amader Paribartan

has started its activities in a modest way in early 1997. At present, its field activities are limited to:

- Advocacy and motivation in the education, health, family planning, sanitation.
- Micro-credit, and
- Human resources development.

So far activities and programs are being managed by the resources of the community. To run the organization, it has a small executive committee consisting of a few persons from the people at the grassroot level. The head office of Amader Paribartan is located at Nirala Residential Area, Khulna. It has already applied for registration from the NGO Bureau and Company Registration Department, Government of the People's Republic of Bangladesh.

4.10.2 Solid Waste Management Project

In order to supplement the activities of Khulna City Corporation (KCC), the authority of Nirala People's Welfare Association has requested Amader Paribartan to manage the activities of solid waste disposal from Nirala residential area. In response to this request, Amader Paribartan has taken up this project on solid waste management in December 1997. Primarily, the project aims to assist the City Corporation in maintaining a clean and healthy environment. The basic objectives of the project are:

- Collection of waste from the household levels.
- Disposal of wastes at suitable sites.
- Collection of service charges.
- Participation of community people with urban environmental improvement activities.
- Development of workable mechanism between CBO and the local authority, i.e., KCC.

4.10.3 Project Management Mechanism

There are two rented vans and two boys through which wastes are collected from the individual houses between 2 PM to 5 PM. At present, there are altogether 450 households living in Nirala residential area. These boys either ring the bells or call the persons of the households to hand over the wastes to them. After receiving the waste, they put these on the van. For rendering the service of collecting wastes from the houses, Amader Paribartan charges monthly Tk.10 (equivalent to US$

0.2) from each household. In fact, after collection of solid waste from the household, Amader Paribartan disposes these into nearby low-lying area so as to landfill purposes. These places have not been identified by KCC as places for waste disposal. Nor these unhygienic disposals are collected by the vehicles of KCC.

4.10.4 Constraints

The following constraints in the activities of Amader Paribartan in effective implementation of solid waste management have been observed:

- Interaction with KCC is either absent or minimal
- Improper places used for waste disposal
- All households of Nirala residential area are not within the project coverage
- Wastes not sorted for further action, i.e., not separated as disposable and non-disposable for recycling and income generating activities purposes
- Absence of direct involvement of households
- Lack of maintaining time of collection of wastes from households
- Presence of child labor
- Lack of adequate funds and equipment
- Lack of trained personnel
- Activities not evaluated and monitored
- Absence of effective and realistic legal arrangements on activities of solid waste management among GOs, NGOs, CBOs and private organizations

4.10.5 Lessons Learned

- Wastes should be used for micro-enterprise purposes
- Motivation and raising awareness are key support to activities
- Involvement of the households
- Advisory services from the resource institutions and persons
- Exchange of information and technical know-how

4.11 Major Problems in Solid Waste Management

4.11.1. General Problems

Constraints identified in solid waste management by KCC are:

- Poor revenue collection, which limits funds available for conservancy services

- Even if the tax at the current rate was fully collected, it would not provide sufficient funds for conservancy services
- Lack of adequate manpower and equipment
- Lack of adequate number and capacities of the dustbins
- Improper placing of the dustbins
- Unhygienic waste handling practices by the conservancy staffs – occupational risk
- Lack of civic sense to place waste in dustbins
- Inefficient and inadequate primary collection
- Lack of sufficient and adequate secondary collection points, properly constructed and maintained
- Unsanitary disposal through dumping at dump site
- Lack of resource recovery, e.g., composting, biogas
- People resist paying NGOs/CBOs a fee for providing collection services; people need to be aware that they should pay for the additional service
- Lack of database on solid waste

4.11.2 Special Problems

Following are the special problem areas identified in the context of solid waste management in Khulna City Corporation area—

- Polythene bag problem: This is creating severe environmental problem by blocking city drains and reducing fertility of topsoil.
- Secondary disposal point: Only a few secondary disposal points constructed by some NGOs are available in the city. If the numbers of the secondary disposal points are increased it will ensure quicker removal of waste from the city.
- Clinical and hazardous waste management: At present all sorts of wastes are dumped together in the same dustbin. Clinical and industrial solid wastes are very hazardous and may pose substantial public health risk. Separate management options should be devised for these high-risk wastes. Laws should be promulgated and their strict enforcement should be ensured to manage these hazardous wastes safely.

4.12 Relevant Projects in the Pipeline

Solid Waste Management Project – Annual Development Program (GOB funded)

- Land acquisition for a sanitary landfill, purchase of tipping garbage trucks, hydraulic lifting garbage trucks, mobile toilet van, etc., just started in late 1998, 3-4 year project.

Municipal Solid Waste Management Project – UNDP/World Bank Project
Implemented by Prodipan. It was started in March 1997, continues to 2000 in order to develop community-based aspects of solid waste management; integrating with KCC services. Operating in six wards. Prodipan will start work on medical waste management for 30 clinics throughout KCC area in next several months. Will also start work on composting.

- Community members have shown strong interest and are participating in management of services.
- Community residents are subscribing to household collection services and paying fees.
- Several CBOs, including some organized by ward commissioners, have started to provide household collection services in other wards.
- Ward commissioners have provided assistance to start services by CBOs and NGOs.
- It is important to maintain effective communication with Ward Commissioners.

Municipal Services Project - (World Bank funded)

National project, designed for two City Corporations including Khulna (and 16 municipal towns) includes a solid waste component.

Urban Environmental Sanitation Project – UNDP/World Bank

4.13 Recommended Action

It is not possible to improve the solid waste management situation overnight especially for a resource starved third world city such as Khulna. However, if well-thought coordinated efforts are undertaken ensuring people's participation and commitments from the political leadership, situation could improve. The efforts needed to improve the system could be categorized in the following three categories.

4.13.1 Immediate or Short Term Activities

Research-oriented activities to identify actual nature of the problem and to find out most appropriate solutions to the problem should be the first priority action. This

sort of activity can be started immediately and should not take more than 1 year to complete. Following are some of such activities, which require detailed research:

- Waste stream analysis.
- Estimation of service life of the existing final disposal site.
- Finding out alternative disposal site and alternative method of disposal.
- Technical and financial feasibility of alternative disposal options such as establishment of compost plants and biogas plants should be studied.
- Reassessment of service delivery system of KCC.
- Reassessment of technical capability of KCC.

Besides research activities, immediate steps should be taken to ensure highest possible utilization of existing human resource and infrastructure. People's participation in supervising local cleanliness could improve the situation a lot.

4.13.2 Medium Term Activities

Medium term activities should take 1 to 2 years to complete. These sort of activities would require moderate funding and at the same time changing existing laws or promulgating some new laws. Some medium term activities are listed below:

- Expanding existing NGO/ CBO activities throughout the city corporation area.
- Establishing of compost and biogas plants for managing biodegradable part of the generated solid waste.
- Enhancing waste recycling activities through providing incentives to the waste pickers and small vangari businesses.
- Providing necessary safety gears to the KCC staffs involved in conservancy activities.
- Conducting mass awareness campaign among the city dwellers regarding safe and orderly disposal of wastes.
- Changing existing municipal laws to give legal basis to the NGO and CBO activities.

4.13.3 Long Term Activities

Long term activities should take 3 to 5 years. These activities will require huge capital investment from GOB and/or donor agencies. Some of those activities are:

- Changing the design of KCC constructed dustbins and construction of more bins.
- Procuring of more modern vehicles and instruments for conservancy service.
- Increasing manpower of the conservancy department of KCC .
- Constructing of more secondary collection points.
- Introducing sanitary landfilling as final disposal option instead of presently practiced crude dumping.

REFERENCES

Anon, (2000). "Draft Environmental Risk Management Plan for Khulna City", Prepared primarily by staff members of Khulna University on behalf of the members of the Technical Committee of ERMP for USAID, Dhaka, Bangladesh.

Ahmed, S. (1998). "Diffusion of Biogas Technology in Rural Areas Through Community Participation: A Case Study of Sharafpur Village Under Dumuria Thana", Unpublished BURP Thesis, submitted to Urban and Rural Planning Discipline, Khulna University.

Aqua-Sheltech Consortium (1998). "Comprehensive Report: Preparation of Structural Plan, Master Plan and Detailed Area Plan for Khulna city. Vol1", Khulna Development Authority, Khulna.

Chakraborty, D. (1998). "Solid Waste Management System of Khulna City Corporation – A Study on Ward No. 24 and Ward No.25 of Khulna City Corporation Unpublished BURP Thesis, submitted to Urban and Rural Planning Discipline, Khulna University.

Ferdous, A.F. (1999). "A Study on Solid Waste Management in Nirala Residential Area, Khulna City; project thesis submitted in Urban and Rural Planning Discipline for partial fulfillment of the Bachelor of Urban and Rural Planning Degree in Khulna University.

Hossain, M. A. (1998). "Generation, Characteristic and Management of Solid waste in Khulna City Corporation", paper presented in the workshop on solid waste management in Khulna city held at BIT, Khulna, Bangladesh on 26 October, 1998 organized by the Committee for Advanced Research and Studies, Council of BIT and BIT, Khulna.

Keya, N. A. and Khanom, N. (1996). "Study of Solid Waste Disposal and Water Supply Systems of Khulna City Corporation", unpublished B.Sc. Engineering thesis submitted to the Department of Civil Engineering, BIT, Khulna.

Khan, M. M. R., Rahman, M. M. and Uddin, M. M. (1993). "Solid Waste Management and Landfill in Khulna City Area", unpublished B.Sc Engineering thesis submitted to the Department of Civil Engineering, BIT, Khulna.

Ministry of Law and Justice (1984). "The Khulna Municipal Corporation Ordinance", Government of the People's Republic of Bangladesh.

Muna, S. (1997). "A Comparative Analysis of Public and Private Sector Involvement in Urban Solid Waste Management in Khulna City", Unpublished BURP thesis, submitted to Urban and Rural Planning Discipline, Khulna University, Khulna.

Parveen, A. (1996). "Performance Evaluation of Existing Biogas Plants in Khulna City", unpublished BURP thesis, submitted to Urban and Rural Planning Discipline, Khulna University, Khulna.

Rahim, M. A. and Sarker, M. M. (1998). "Soil Bentonite Liner for Sanitary Landfill Site", unpublished B.Sc. Engineering thesis submitted to the Department of Civil Engineering, Bangladesh Institute of Technology (BIT), Khulna.

Urban and Rural Planning Discipline (1999). "Environmental Maps and Workbook for Khulna City", Regional Urban Development Office of USAID for South Asia & Khulna University, Bangladesh.

PROFITS FROM WASTE: NGO LED INITIATIVE FOR SOLID WASTE MANAGEMENT IN LUCKNOW

by

Mewa Lal

1.0 INTRODUCTION TO MUSKAN JYOTI SAMITI

1.1 Origin

The Muskan Jyoti Samiti (MJS) was established as an NGO in the year 1994. It is duly registered as a Society with the Registrar of Societies, U.P. under section XXI of the Registration Act, 1860.

1.2 Aims and Objectives

The main aim of the Muskan Jyoti Samiti is to provide service on a participatory basis to collect and dispose solid waste from the doorstep of the people's houses. It also aims at converting the organic waste thus collected into compost manure. The disposal of hospital waste is also a prime concern and objective of the Muskan Jyoti Samiti.

1.3 Interventions

Since inception Muskan Jyoti Samiti has undertaken several initiatives in the field of Solid Waste Management and also proposes to undertake similar other activities in many areas. It is providing successful service delivery of solid waste collection and disposal in Trans-Gomti area and other new localities of Lucknow, covering about 20,000 households currently. This service is being executed with the help of

community participation. This effort is being supported by the State Urban Development Authority (SUDA) and the Commissioner, Lucknow Division. It is also providing service delivery of solid waste collection and disposal from 5000 houses in selected localities of Allahabad City with the support of DUDA, Allahabad on the basis of community partnership.

The MJS is using the organic waste for vermi-composting in a land measuring 10 acres providing by Uttar Pradesh Bhumi Sudhar Nigam in Lucknow. Funds for infrastructure were provided by SUDA (U.P.). The capacity compost plant is 3 tons per day.

A scheme for integrated, self-financed slum development scheme emphasizing mainly on drinking water supply, pre-education, employment generation and women development has been started by MJS in district Unnao, Varanasi, Hardoi, Lucknow through participatory management.

A self employment generation scheme for rickshaw pullers, known as 'Apna Rickshaw Ka Malik Bano' was inaugurated by Prime Minister Sri Atal Bihari Vajpayee .The highlight of scheme is that MJS acts as guarantor for the bank loans for buying rickshaws and has achieved a recovery rate of 100 per cent. Two thousand rickshaw pullers have found employment through this scheme in the cities of Lucknow, Varanasi, Allahabad and Unnao.

1.4 Collaborating-Support Agencies of Muskan Jyoti Samiti

The Muskan Jyoti Samiti has been supported from time to time by different agencies and organizations, in its efforts and initiatives in the field of solid waste management. The main agencies that have supported the initiatives of Muskan Jyoti Samiti, whether the purchase of equipment, in meeting out of initial operating costs, community mobilization and environmental impact assessment, etc., include:

- State Urban Development Authority (SUDA), supported in purchase of equipment and machinery
- UNICEF, helped in effecting a community awareness program
- District Urban Development Authorities (DUDA), Lucknow, financed purchase of equipment and machinery
- District Urban Development Authorities (DUDA), Allahabad; helping in purchase of equipment and machinery.

1.5 Project Goal

The goal of the project is installing a complementary, need based, community-oriented solid waste management system toward ensuring hygienic living environment.

1.6 Project Objectives

The main objectives of the projects are:

- To provide a community based doorstep solid waste collection and disposal service to residents of the project area.
- To launch an awareness program within the project area on environmental sanitation and personal hygiene issues.
- To employ community based approaches to planning, implementing and managing of the basic sanitation services within the localized limits of the project area (bastis) with particular attention to the management of solid waste.
- To examine and test possibilities of initiating and developing a network of NGOs and CBOs for networking a citywide solid waste management program.

1.7 Project Concept

Traditionally Indian culture has valued and given importance to a clean and healthy mind, clean and healthy act, clean and healthy living style, and a clean and healthy environment. Such precepts are based on the belief that the clean and healthy mind, acts, life and environment, do good not only to an individual but also provide welfare of all. For literally, *"SWASTI"* a Sanskrit word, implies "WELFARE". Incidentally, written in English in the Arabic script spell *Swasti* which represents an acronym for Solid Waste Initiatives. Hence, it was found appropriate, to title the project as the SWASTI PROJECT.

2.0 SWASTI PROJECT

The SWASTI Project, keeping in mind the limitation of the governmental machinery particularly in service delivery for solid waste collection and disposal, has been designed as a complementary effort to the municipal service delivery system. The project is proposed to be implemented on the basis of community

participation and initial establishment support from the support agencies. The *SWASTI* project is to provide the following services:

- Daily collection of garbage, collected in special garbage bags from the doorstep of the subscribing household, by project personnel.
- Cleaning of roads and streets of the locality, once a week or as required.
- Transportation of garbage collection from households, in covered bags loaded in covered vehicles.
- Scientific disposal of the organic material in the garbage collected to produce vermi compost manure.
- Tree plantation in subscribing localities through community participation and government support.

In order to ensure sustainability of the continuance of service delivery, the subscribing household shall be asked to contribute Rs.15 from slum dwellers, Rs. 20 from economically weaker section, Rs. 25 from middle income group localities and Rs. 30 from localities which have open drains and broken streets. The subscription collected from the beneficiaries is expected to help the project in meeting out the operating costs for ensuring service delivery.

2.1 Vermi-culture

Vermi-culture is a self-designed, self regulated, self-improved and self-powered ecosystem involving diverse beneficial soil bacteria, earth worm and the plant root zone. Metabolic product of one becomes food for the others, thus maintains its sustainability. Vermi-culture, thus, is a zero-waste technology. Earthworms play a key role in vermi-culture. Vermi-culture has been demonstrated in diverse organic residues generated in agriculture, cities' agro-processing, food and biotechnology industries. It is seen that vermi-culture generates 100-1000 times higher value as compared to the conventional techniques of composting. Vermi-culture excels these techniques because it harms beneficial soil bacteria to produce resources without an input of external resources (such as electricity for alteration) and without production of any residual stream.

2.2 Vermi-compost

With the change of time, potential and capacity of our soil is deteriorating day to day. With rapid growth of population, different means have been adopted to feed

huge population. In the way, rapid use of chemical fertilizer and pesticide comes into the feature. Every year the amount of chemical fertilizer deteriorates the soil strength and is slowly moving toward barren land. The old friend of farmers called earthworm is helping farmers by its natural process of tilling the soil and giving space for plant to grow. They are now decreasing very frequently in numbers due to excessive use of chemical fertilizer. With the emergence of chemical fertilizer and pesticides the food has become adulterated and toxic, which affects human and animal life. It has also affected our eco-system and disbalanced the ratio. Many birds and lives are hardly seen these days. Vermi-compost is the limelight in this direction to save human and animal life and to maintain the balance of our eco-system. Vermi-compost is an eco-friendly fertilizer prepared by farm and organic residue with the help of earthworm. This is helpful for soil to retain its original value and texture without harming the production level. 'Muskan Jyoti', the pilot manufacturer of vermi-compost manure is also interested in imparting training to farmer to make them self-reliant in the field of vermi-compost fertilizer.

2.3 Vermiwash

Foliar sprays are a part of plant growing practices and several expensive packages of foliar sprays are today available in the market. Worm worked soil has burrows formed by the worms which aid in the passage of water. Washing the nutrients from these burrows to the roots to be transported to the shoot. This principle is applied in the preparation of vermiwash. The vermiwash therefore is a good foliar spray. Vermiwash is sprayed on plants as a foliar spray. It has proved very effective on vegetable plants like okra, tomato, beans, eggplants, lawns, golf courses and orchids. If needed, vermiwash may be diluted with water as a spray, or may be diluted in 10% cow's urine as an organic pesticide.

2.4 Formatting Idea

We generate large quantities of waste matter which include non-biodegradable waste, such as metal, glass, plastics, polythene paper, etc., are collected and recycled to the respective industries. The rest is mostly organic and non-toxic. Quantity of such waste is very large and remains improperly dumped and is thus affecting the quality of life consisting of soil, air, water and the bio-diversity around us.

There are several technologies available for the disposal of these organic wastes:

1. Production of Electricity.
2. Chemical Degradation.

Both the technologies have been unsuccessful in our country due to cost effectiveness. The third technology which has been explored extensively is Vermi-culture Eco-Biotechnology, which is earthworm-powered technology to convert organic waste to produce a sustainable bio-fertilizer 'vermi-compost', a zero waste technology.

2.5 Objective of the Project

(a) To harness vermi-culture eco-biotechnology to keep our environment clean and produce value added resources from organic waste.
(b) Extension of vermi-culture at farmers level to reduce external input of chemical fertilizer and pesticides.
(c) Bio-remediation of soil and promotion of sustainable agriculture-organic framing.
(d) Employment generation and increase of employment opportunity at local level.
(e) To reduce government revenue subsidies.

3.0 VERMICULTURE ECO-BIOTECHNOLOGY: AN OVERVIEW

Nature generates organic waste which is utilized to produce a living soil. Earthworms play a key role in the management of organic waste and bio-processing of soil. They regulate the soil pH, temperature, moisture, oxygen and other nutrients that are ideal for beneficial soil bacteria and plants.

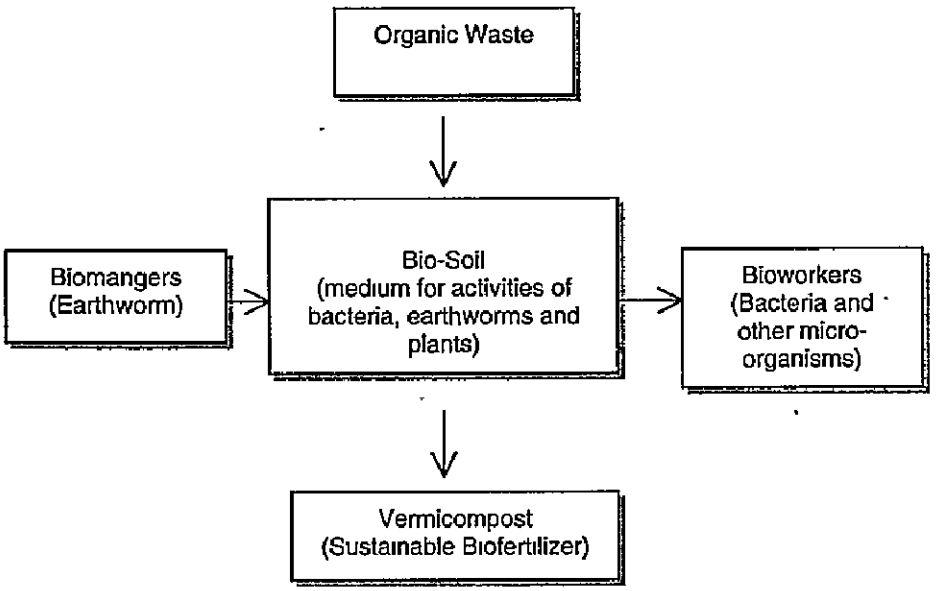
Organic Waste
Biomangers (Earthworm)
Bio-Soil (medium for activities of bacteria, earthworms and plants)
Bioworkers (Bacteria and other micro-organisms)
Vermicompost (Sustainable Biofertilizer)

Figure IV.5 Vermi-Culture Eco-Biotechnology

Use of chemical fertilizers and pesticides has caused severe disturbances by reducing the soil bio-diversity. Its application has resulted in increased pest attack and affected the nutritional composition of crops/plants. Efforts are required to produce living soil by using vermi-compost to increase bacterial/microbial population and other matter in soils. These living soils can, in turn, provide healthy and balanced nutrition to the plants, which result in healthy plant growth without insects and diseases. Pollution due to agro-chemicals is also avoided.

4.0 BENEFITS OF VERMICOMPOSTING TO FARMERS

The major benefits of vermi-composting to farmers include the following—

a) Eco-friendly technology of organic waste utilization.
b) Marked reduction in expenditure on chemical fertilizer/pesticides.
c) Minimal cultivation requirement.
d) Reduction in irrigation by 40-50%.
e) Quality production without any significant loss of yield.

4.1 Communication and Extension of Vermi-culture Biotechnology

Development and the practical communication require effective and diverse sectors particularly industries, academic institutions and research establishment.

4.1.1 Communication to Urban People

Urban people have the urge to maintain small gardens. Vermi-culture activity can be initiated at household level in various cities to bring about utilization of kitchen, to produce vermi-compost.

4.1.2 Communication to Farmers

Importance of vermi-compost must be communicated at village level so that the agro-waste and animal waste are not wasted and are converted to vermi-compost for large scale utilization in crop cultivation

4.1.3 Communication to Academic/Research Institution

Effective communication ought to be developed for the propagation and quick extension of the vermi-technology at all levels by means of authentic research, integration, extension and upgradation of the earthworm based technology.

4.1.4 Communication to Government

Effective communication to this sector is most essential since all the policies related to agriculture, water supply, health, education, family welfare, finance, commerce, etc., are governed by government.

4.1.5 Communication to Industries

The industrial waste could be utilized to produce a marketable product. The communication must be brought about so that the problem of industrial waste could be solved through vermi-culture biotechnology.

4.2 Bio-production Through Sustainable Agricultural-Organic Farming/Agriculture: A Bargain

1. Plants growing on bio-soil are healthy and resist pest attack.
2. Vermi-compost speeds up the soil, process, and thus pests are controlled to produce healthy living food that reflects on the health of consumers.
3. Fruits and Vegetables get dehydrated rather than spoiled, if they are produced organically.
4. Organic produce has higher vitality and nutrition qualities (good tastes, good luster, and better keeping qualities).

Schuphan, after 12 years of research, has reported that the organic vegetables had higher concentration of desirable components (shown in the Box IV.2).

Box IV.2 Concentrated Components in Organic Vegetables

23%	Higher Dry Matter
18%	More Protein
28%	More Vitamin C
17%	More Iron
18%	More Potassium
13%	More Phosphorous
10%	More Calcium

5.0 CONCLUSION

Vermi-culture - biotechnology harnesses the earthworm ecosystem for bio-conversion of organic waste into vermi-compost, the sustainable bio-fertilizer which has extensive application in waste management, sustainable organic farming and waste land development. It is the only cost-effective technology of:

- Municipal solid waste management
- Agro-waste and animal waste management
- Kitchen waste management
- Industrial waste management
- Thus, vermi-technology can be a reflection of an eco-friendly approach of an environmentally clean society

5.1 Economics of the Solid Waste Management for One Unit

Table IV.7 Garbage Production (5000 houses)

Sources	Weight
Garbage production per day @ 500 gm/house	2.5 ton (approx.)
Garbage from other sources	1.0 ton (approx.)
Total	**3.5 ton (approx.)**

50% of the collected garbage is organic substance, 30% of the collected garbage may be recycled and rest 20% is only useful for sanitary landfillings.

Table IV.8 Revenue from the Project

Revenue	Amount (Rs.) per month
1. Approximately 35% manure compost is produced after decomposition of organic substances. 35% of 1.5 ton = 0.6 ton/day manure compost. Value @ Rs. 3,000/ton = Rs. 1,800/day.	54,000.00
2. Income from 30% recycled substances (1.05 ton/day). Value @ Rs. 2,000/ton = Rs. 2,100 /day.	63,000.00
3. Public contribution Avg. @ Rs.20/house/month = Rs. 1,00,000. 10% failure of contribution = Rs. 10,000/month	90,000.00
Total Receipts	**2,07,000.00**

Table IV.9 Expenditure

1. Salary for 85 person @ Rs.2,000/month	1,70,000
2. Transportation expenses/maintenance of equipment	20,000
3. Consumable (garbage bags, brooms, etc.)	10,000
4. Rent of office & others	6,000
Total Expenditure	**2,06,000**

WASTE BUSTERS: AN EXPERIENCE OF PAKISTAN

by

Anjum Parvez Qureshi

1.0 PROJECT DESCRIPTION

1.1 Objectives of the Project

The objectives of the project are many. The main and foremost objective is to maintain sustainable development through community participation in resource preservation by solid waste management and income generation through recycling. Another objective is to combat the massive garbage accumulation in order to provide a clean and healthy environment. This projects also goes one step further by aiming at creation of employment opportunities.

1.2 Problems Identified

A study of the prevailing waste disposal system was carried out and the following problems were highlighted.

1. The waste generated by the household is supposed to get to the municipal bin but rarely makes it there. It is deposited on empty plots, street corner, open spaces, water courses or railway tracks, etc., usually on land that is not claimed or cared for by anyone.
2. A small percentage that gets to the municipality collection point is rummaged through by the scavengers who will collect all the recyclable and leave the rest behind.

3. Street dogs and cats will further spread the rubbish around.
4. Since the residue left is spread far and wide outside the municipal bin, it becomes quite unmanageable and is not lifted properly by the municipal staff.
5. The Municipal trucks are supposed to take this to the landfill site outside the city, however here again other factors come into play and a small percentage makes it to the landfill site. The remaining ends up halfway between the city and the landfill point to save on fuel or the drivers are provided with incentives by the scavengers to off load it close to their settlements.
6. Finally even the small percentage that makes it to the landfill site is not disposed of in an environmentally friendly manner and is either spread around or burnt thoughtlessly, adding to the pollution.

1.3 Findings from the Study

The conclusions drawn from this study were :

1. The waste must be in a container (bag) to make it manageable.
2. It has to be kept at source till it is collected and so it has to be collected from door to door.
3. The waste is then to be taken to the transfer station which is located within the area. Here the recyclables are separated and the leftover organic waste is taken to the landfill site where it is turned into compost.

The idea behind this whole exercise is income generation and making the project not only sustainable but also profitable. A nominal user fee is charged which in addition to covering the cost of the bags supplied to the household on a monthly basis also forms a basis for monitoring by the residents, since people are paying for a service they are more likely to regulate its performance.

2.0 LINKS WITH MUNICIPAL AUTHORITIES

It is very important to work in close liaison with the municipal authorities. Their co-operation is needed in the following areas:

1. Formal permissions to operate in the area under their jurisdiction.
2. The already established informal contacts that the civic authorities have with the influential people in the community are useful to achieve community participation.

3. If the scheme is launched as a joint project between the municipal authorities and the NGO, it carries more legitimacy.
4. Land is required for transfer station. This can usually be provided by the municipality, alternately if it is acquired privately, it becomes an expensive proposition and in some cases not even feasible.
5. Assistance of the municipal vehicles is required in getting the residential waste to the landfill site.
6. Land at the landfill site is required for setting up a composting plant. However in some cases it might be feasible or even advantageous to have privately owned land for this purpose.

3.0 POSSIBILITIES OF SCALING UP AND CONSTRAINTS

The possibilities of expanding operations are endless, both horizontally and vertically. In this country this is just the beginning of even recognizing the problem let alone thinking about its solutions or realizing the potential of growth, sustainability or turning it into a profitable venture. This is just the tip of the iceberg in tackling the solid waste management. With the ever-increasing awareness hopefully more areas will become available for such initiatives as "Waste Busters". Similarly in terms of scaling up, a number of downstream activities such as composting, recycling or even energy generation can be taken up.

One of the biggest constraints, of course, is financial. It has been noticed in our operations that it is quite difficult to generate substantial income through sorting and selling the recyclable since the waste collected from the household has already primarily been sorted and the recyclable taken out. The nominal user fees are not enough to cover the cost of bags supplied to the households, the printing of the awareness material, transport and staff salaries. The project therefore becomes sustainable only after a minimum user target is achieved. While operating in a new area, this could take upto several months. During this period finances are needed. So although the end objective might be to make the project sustainable, money is required, and lack of sufficient funds restricts us to start simultaneously in a number of zones where we would want to.

The other major constraint at times is the lack of understanding and co-operation by the municipal authorities. Within these organizations there are pressure groups that would not like such initiatives to be taken and flourish. Sometimes even well-intentioned municipal officers are bogged down due to inherent inefficiency and red-tapism in these organizations.

A third major constraint is lack of awareness and apathy of the general public toward the existing state of unhygienic and unorganized waste disposal (if you can call it disposal). A massive awareness campaign is needed to make the masses realize the immensity of this problem and to get them involved in alternate solutions.

4.0 SUPPORT MECHANISMS REQUIRED FOR SCALING UP

There are four areas where support is required:

1. Financial: This can be resolved through several ways. One is done through small, medium term commercial loans. Fund from various international donors and corporate support is another viable option. The other options include private investment which has great limitations and raising fund from within the community which is a very difficult option.
2. Training of Personnel: Since this is a relatively new field in this part of the world, it is difficult to find trained people to handle projects of this nature. It is therefore important that training programs, workshops and short courses are conducted.
3. Awareness: Professional help is required in preparing campaigns for community mobilization and awareness both at local and national level.
4. Legislation and its enforcement: The local by-laws have to be examined very carefully. It has been noticed that in most cases they are desperately lacking in legislation concerning the proper disposal of waste and even if there are certain provisions these are not being enforced either totally or partially. It is very important that voluntary acts by the community are substantiated by legislation.

5.0 CONCLUSION

As I have explained earlier the possibilities and potential of expansion is immense. In fact in Lahore Waste Busters is currently running as a micro-enterprise. In Karachi we are relatively new and there are problems peculiar to each city. However, if we look toward the waste, Solid Waste Management is a big business there. Therefore, I have no doubt that given all the necessary ingredients as described earlier there is no reason that this project cannot be run as a micro or even a medium sized and eventually a mega-enterprise.

PARTICIPATORY SOLID WASTE MANAGEMENT

by

Sumit Chaturvedi
and
Dr. Vivek S. Agarwal

1.0 THE FOUNDATION

The emergence of new thinking in areas of governance has been propelled by participative addressing of the issues of concern. A gradual but sure-footed movement toward truly democratic forms of handling the problems is fast emerging. The areas which were previously seen as the sole preserve of governmental intervention are now inviting more and more active participation from the people at large. The conventional top-down approach is giving way to local management and settlement of issues responsibly and satisfactorily.

The Public Choice theorists or the New Right Group members, as they are referred to, have been in the vanguard of the forceful argument that Governments need to restrict themselves to regulatory, effective monitoring and facilitatory roles. Just as privatization is seen as an answer to handling the economic problems, Governments need to operate through NGOs in a wide range of social activities to maximize the impact and reach of their welfare initiatives. The new public management advocated the concept of Entrepreneurial Governments with 3 E's as their raison-de-etre- Effectiveness, Efficiency and Economy.

Under these emergent changes, voluntarism does not remain a mere anti-thesis of state efforts but becomes complementary to them through wider, effective and participative approach to the problems concerning all of us. NGOs have made it possible for the Government to move toward a "short arm, long fingers" structure as a distinct departure from the earlier practices. It is, indeed, becoming the fifth pillar of democratic edifice along with the legislature, the executive, the judiciary and the press.

The concept of popular participation, which gives the NGOs an edge in dealing with problems concerning people, involves creation of alternative, human-centered approach of finding solutions and renders four basic functions:

1. Cognitive—local wisdom and knowledge systems get proper recognition and generate low-cost, workable alternatives;
2. Political—provide legitimacy to these alternatives and bridges the gap between the establishment and the people;
3. Instrumental—becomes a tool for reassessment and consequently empowerment on a wide scale;
4. Social—active dissemination of new consciousness that perpetuates the cycle of participative approach.

2.0 THE STRUCTURE

Solid Waste Management is a galloping problem facing the fast growing urban centers. The increased population converging at these centers in search of better livelihood opportunities has put obvious pressures on the limited resources of municipalities with regard to land, labor and money.

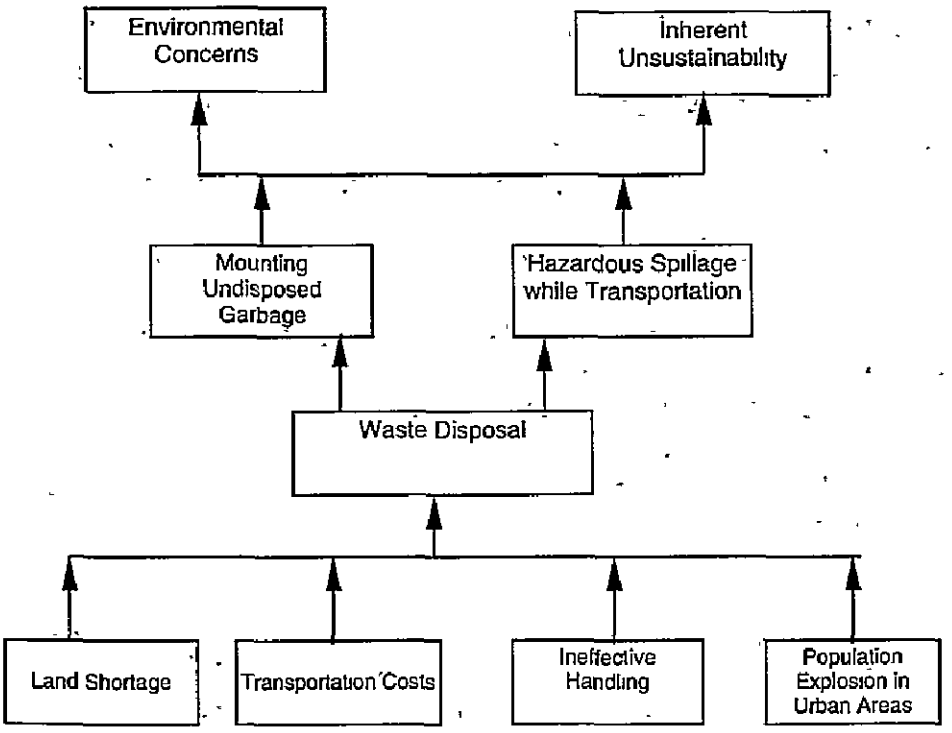

Figure IV.6 The Problem Tree

The CDC experiment tries to solve the problem through innovative approach of making the people the focus of the model. The circularity of the model ensures maximum recyclability and answers the problems of finding land for trenching grounds, poor hygienic surroundings due to littering and finding finances for providing the services. However, the most important aspect is the people's participation and it is this that makes the model go round.

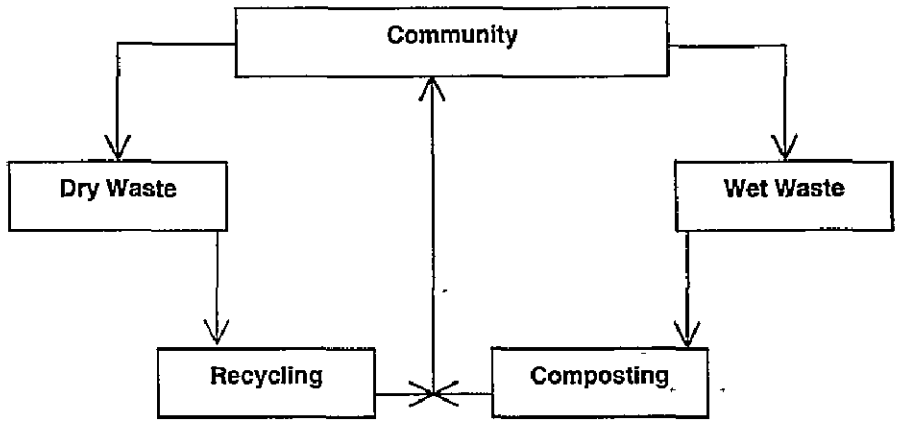

Figure IV.7 The CDC Model

2.1 The Infrastructure

CDC becomes the nodal agency and provides the basic requirements through the initial financial support from the local municipal body like the rickshaw trolleys (specially designed to ensure that the garbage remains covered through the whole transportation process).

2.2 The Superstructure

CDC again becomes the nodal agency for arranging, planning and ensuring the presence of labor in the respective areas. Not only this, the respective supervisors are provided with pagers to ensure prompt redressal of any grievances that may be reported to the central office.

2.3 The Suprastructure

It is the suprastructure that is vital for the survivability and effectiveness of the model.

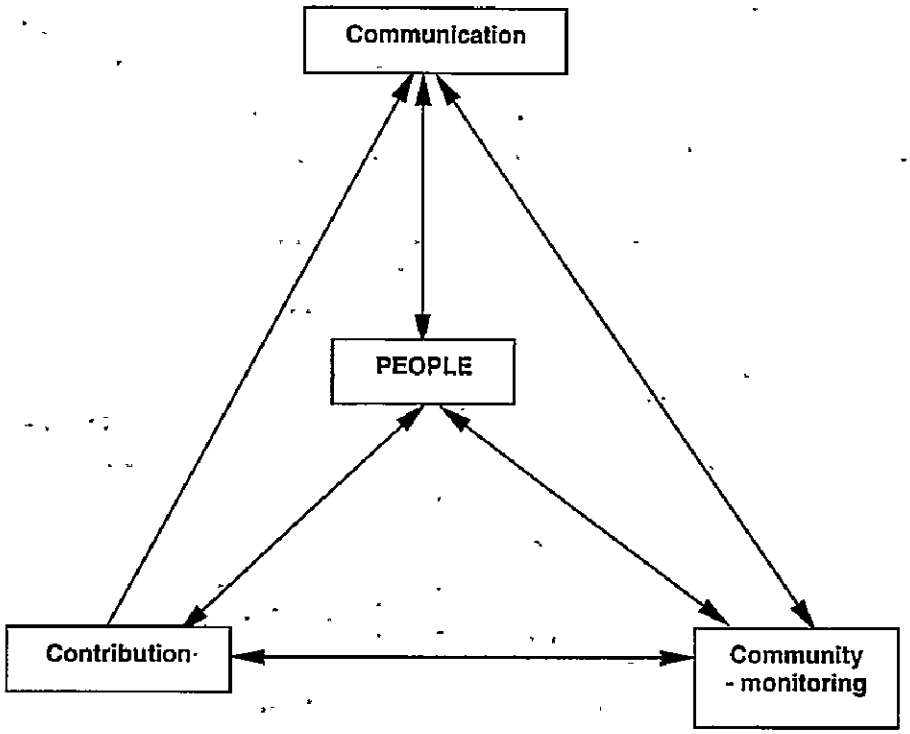

Figure IV.8 Active Role of 3 Cs.

This structure depends on the active role of 3 Cs :

Communication: The channels of communication are the backbone of the whole program. It is through increased awareness, constant interaction and a frank feedback that flaws and problems are addressed immediately

Contribution: The monetary aspect of running the program which needs the help of a large labor force for satisfactory execution is met through the contributions from the community at large, making it a self-sustainable venture.

Community monitoring: The effective check on the field staff is a result of the vigilant community monitoring that keeps all the workers on their toes and results in a sense of responsible belongingness to the program.

2.4 The CDC Program Matrix

Goal - High quality service	**Indicator** - Daily removal of household waste	**Assumption** - Community cooperates
Purpose - Solving the urban waste problem	**Indicator** - Zero garbage on roads	**Assumption** - Community monitors
Output - Labor and trolleys for collection	**Indicator** - 1 trolley and 2 labor for every 200 households	**Assumption** - Community contributes
Activities - Training, organizing and composting	**Inputs** - Finances from Municipality, land tract for composting	**Assumptions** - Community supports and sustains

3.0 THE ADDITIONS

- The people's involvement is not limited to the successful running of the program only. In fact, it leads to an all round increase of awareness about the issues of environmental concern and people take pride in the fact that their model takes care of the waste in a productive manner. The compost, being generated in the colony proximity, is again patronized by these very people who become ambassadors and champions of a wider cause.
- The improved status for the cleanliness workers, fondly referred to as the "Swacchata Mitras" , is a direct outcome of the program and has won all round appreciation from both the workers and the larger community. The equal opportunity employment underlines the commitment and wider sensitization to gender related inequities.
- The model is replicable on a wide scale because the initiative grows from inside the community rather than being imposed from outside. Participants themselves become the change agents leading to seamless transitions to better living conditions. The feedback channels get activated and prompt redressal of grievances ensures that the communication remains unclogged and livewire.

PART V

REGIONAL ISSUES ON COMMUNITY BASED SOLID WASTE MANAGEMENT AND RESPONSE FROM GOVERNMENTS

MODERNIZATION OF SOLID WASTE MANAGEMENT PRACTICES IN INDIA WITH NGO, PUBLIC AND PRIVATE SECTOR PARTICIPATION

by

P. U. Asnani

1.0 INTRODUCTION

Solid waste management is an obligatory function of Urban Local Bodies (ULBs) in India. However, this service is poorly performed resulting in problems of health, sanitation and environmental degradation. With over 3.6 % annual growth in urban population and the rapid pace of urbanization, the situation is becoming more and more critical with the passage of time. Infrastructure development is not in a position to keep pace with population growth owing to the poor financial health of most of the urban local bodies. Solid waste management, one of the essential services, suffers the most in such a situation. Lack of financial resources, institutional weakness, improper choice of technology and public apathy toward solid waste management has made this service far from satisfactory.

2.0 PRESENT SCENERIO OF SOLID WASTE MANAGEMENT SERVICES

2.1 Waste Generation

Waste generation ranges from 200 gms to 500 gms per capita per day in cities ranging from 1 lac to over 50 lacs population. The larger the city, the higher is the per-capita waste generation rate. The total waste generation in urban areas in the country is estimated to exceed 39 million tons a year by the year 2001.

2.2 Composition of Waste

Indian mixed waste has a large proportion of compostable material and inert. As per NEERI studies compostable matters range from 30% to 57% and inert materials from 40% to 54%. The component of recyclable material is between 5% and 10%.

2.3 Technology of Storage, Collection, Transportation and Disposal of Waste

The prevalent SWM practices in the country are highly deficient. Generally no storage of waste is being done at source and instead domestic, trade and institutional wastes including bio-medical and industrial waste are thrown on the streets, footpaths, drains and water bodies treating them as receptacle of waste. Recyclable waste material is also not segregated at source and is disposed of on the streets, along with domestic, trade and other wastes. Construction and demolition wastes also pose a serious problem as these wastes are also deposited on the road side or open spaces, obstructing traffic and causing nuisance.

2.4 Primary Collection

There is no system of primary collection of waste in most cities in India. The waste is thrown on the streets. Collection efforts from the streets and/or from the street bins are inadequate in number and ill designed.

2.5 Waste Storage Depots

Open sites or cement concrete bins, metal bins, masonry bins and structures are used for temporary bulk storage of wastes. These bins are very unhygienic and necessitate multiple handling of wastes. Waste is more often seen outside the bins than inside them since they are not cleared daily.

2.6 Street Sweeping

Street sweeping is not carried out regularly. Several streets are occasionally swept or are not swept at all. No sweeping is done on Sundays and public holidays in many cities. The tools used for street sweeping are also inefficient and out-dated.

2.7 Transportation of Waste

Transportation of waste is done through a variety of vehicles such as bullock carts, three-wheelers, tractors and trucks. Some cities use modern hydraulic vehicles.

Most transport vehicles are loaded manually and utilized in one shift only, although the number of transport vehicles is inadequate. The fleet of vehicles is thus not optimally utilized. Inefficient workshop facilities deplete the fleet of vehicles. The transportation system also does not synchronize with the system of primary collection and bulk waste storage facilities. Multiple manual handling of waste becomes necessary.

2.8 Processing and Disposal of Waste

Generally no processing of waste is done in the country except in a few cities where decentralized or centralized composting is done on a limited scale. Disposal of waste is done in a most unscientific manner. Generally crude open dumping is adopted for disposal of waste in low-lying areas. Most local bodies deposit waste at the dump-yard without ascertaining the suitability of the land for waste disposal and do not bother to cover the waste with inert material. These sites emanate a foul smell, become breeding grounds for flies, rodent and pests, and pose a serious threat to underground water resources. Thus the entire system of waste management in the country is out-dated, unscientific and highly inefficient.

2.9 Institutional Arrangements

Institutional arrangements are inefficient. There is lack of professionalism in administration in this service, resulting in poor levels of service. The laws governing the urban local bodies do not have adequate provisions to deal with the situation effectively and local bodies do not have the necessary powers to punish defaulters. Filing cases in the court for sanitation offences have become cumbersome, takes a lot of time and energy and does not give the desired results.

2.10 Community Involvement

There is total apathy on the part of citizens in the matter of handling their waste and in keeping the city clean. Citizens expect the local bodies to keep the city clean despite their non-involvement. NGOs and informal sector of ragpickers are optimally utilized in tackling the ever-growing problems of waste management in urban areas. Sixty five per cent of India's urban population lives in 300 Class I cities having a population above 100,000. These cities have been facing serious problems of solid waste management but no sincere efforts were being made to improve the situation. A public interest litigation was, therefore, filed in the

Supreme Court of India and having realized the gravity of the situation, the Honorable Supreme Court constituted an expert committee to look into all aspects of solid waste management and make recommendation to improve the situation in class-I cities (300 cities).

The committee so formed has carefully considered various options to improve solid waste management practices in these cities and, looking to the present state of SWM practices in urban areas in the country, the institutional capabilities of local bodies, their financial health and other priorities, the Committee has recommended a minimum level of services as under that each local body must provide and has given technological options in the detailed report which the local bodies may consider while choosing the technology suitable for their cities.

3.0 RECOMMENDATIONS FOR MODERNIZATION OF SOLID WASTE MANAGEMENT PRACTICES IN CLASS-I CITIES

3.1 Ban on Throwing of Waste on the Streets

No waste shall be thrown on the streets, footpaths, open spaces, open drains or water bodies.

3.2 Storage of Waste at Source

Waste shall be stored at source of generation in 2 bins/bags, one for food/biodegradable waste and another for recyclable waste. Domestic hazardous waste, as and when produced, shall be kept separate from the above two streams. Multi-storied buildings, commercial complexes and group housing shall additionally provide community bins for storage of waste generated by their members. Community bins shall also be provided in slums by the local body for the community storage of waste by slum dwellers.

3.3 Doorstep Collection of Waste

Both the streams of waste, organic/biodegradable waste as well as recyclable waste, shall be collected from the doorstep. Containerized handcarts or containerized tricycles or small-motorized vehicles shall be used for daily collection of food/biodegradable waste from the source through public participation using a bell, whistle or horn as a means of announcing the arrival of the collection staff.

For collection of recyclable waste from the doorstep NGOs may be encouraged to organize the ragpickers. They may allot them the work of collection of recyclable material from the doorsteps instead of picking it up from the streets, bins or dump-yard, thereby upgrading their status. This waste can be collected once or twice a week according to the convenience of the households, shops or establishments. Hazardous toxic waste material which is occasionally generated shall however be disposed of by the citizens in special bins to be provided in the city at suitable locations by the urban local bodies.

3.4 Sweeping of Streets on All Days of the Year

Sweeping of streets and public places having habitation or commercial activities on one or both sides shall be done on all days of the year irrespective of Sundays and public holidays. Arrangements for rotating weekly rest-days are to be made by the local bodies.

3.5 Work Norms for Sweeping of Streets

Work norms ranging from 250 to 750 running meters of road length have been recommended, depending on the density of the area and local conditions. Giving a demarcated "pin point" area for street sweeping and waste collection is also recommended for optimum utilization of manpower.

3.6 Provision for Litter Bins at Public Places

Provision of litter-bins at railway stations, bus stations, market places, parks, gardens and important commercial streets may be made to prevent littering of streets.

3.7 Abolition of Open Waste Storage Sites and other Unhygienic Street Bins

The pathetic condition of street bins must be corrected by the provision of neat mobile closed body containers into which waste can be directly transferred from the containerized handcarts or tricycles, and all open waste-storage sites as well as cement concrete or masonry bins must be abolished in a phased manner.

3.8 Transportation of Waste to Synchronize with Waste Storage Facility Dispensed with Manual Loading of Waste

For the transportation of waste, a system which synchronizes with both primary collection and bulk waste storage facilities may be introduced. Manual loading and

multiple handling of waste may be dispensed with and, instead, hydraulic vehicles for lifting the containers may be used in larger cities and tractor trolleys or a tractor container combination may be used in smaller cities.

Transportation of waste shall be done on a regular basis before the temporary waste-storage containers start over-flowing. For economy in expenditure, the vehicle fleet should be used in at least two shifts. Workshop facilities may be optimized to keep at least 80% of the vehicle fleet on road. Transfer stations may be set up in cities where the distance to waste-disposal sites is more than 10 kilometers.

4.0 PROCESSING AND DISPOSAL OF WASTE

4.1 Conversion of Organic Waste/Bio-degradable Waste into Bio-organic Fertilizer (Compost)

Since the availability of land for processing and disposal of waste is becoming scarce and the food and bio-degradable component useful to agriculture are wasted, measures for conservation of land and organic waste resource shall be taken and organic shall be returned to the soil. To meet these objectives, all food waste and bio-degradable waste shall be composted, recyclable waste shall be passed on to the recycling industry and only rejects shall be landfilled in a scientific manner. Decentralized composting with public and NGOs/CBO participation, may be encouraged wherever possible, and centralized composting of the rest of the waste may be done. Microbial or vermi- composting processes may be adopted. A variety of composting options has been given in the report and their processes are explained.

4.2 Caution Against Using Unproven Technologies

Local bodies are cautioned not to adopt expensive technologies of power generation, fuel pelletization, incineration, etc., until they are proven under Indian conditions and the Government of India or expert agencies nominated by the Government of India advises cities that such technologies can be adopted.

4.3 Land to be Made Available on Priority for Processing and Disposal of Waste

Availability of land for setting up processing plants and for disposal of waste is a major problem faced by urban local bodies. Government wasteland must, therefore,

be given on top priority for this purpose free or at nominal cost, and if such land is not available or not found suitable, private land should be acquired or purchased through negotiated settlement. A Committee at the district level should identify suitable land and State Governments should form Empowered Committees to give speedy final clearance and prompt possession of suitable land to the ULBs.

4.4 Criteria for Site Selection, Site Development and Landfill Operations

Criteria for site selection, development of landfill sites and scientific landfill operations may be adopted. Remediation of old abandoned landfill sites should also be done as suggested in the detailed report. Bio-medical waste, industrial waste and slaughterhouse waste may be managed as per the relevant rules and guidelines of the Government of India and/or Central Pollution Control Board.

4.5 Institutional Strengthening and Capacity Building

Institutional strengthening is the key to success of the SWM system. Professionalism in administration, decentralization of administration, delegation of financial and administrative powers, induction of environmental/public health engineers in the solid waste management services and fixation of work norms and proper supervisory levels are recommended. Human resource development through training at various levels needs to be taken up. Municipal Commissioners and Chief Executives should not be transferred frequently and should have a tenure of at least 3 years to perform effectively. Inter-city meets for sharing of experiences are recommended.

Adequate safe-guards for the supervisory staff against abuse of the Schedule Caste/Scheduled Tribe (Prevention of Atrocities) Act 1984 may be provided through suitable amendments in the law to enable the Supervisory staff to perform their duties fearlessly.

4.6 NGO/Private Sector Participation in SWM Services

There is a need to improve accountability and the level of services through NGO/Private Sector participation in SWM services to improve overall performance without harming the interests of the existing staff. Suitable amendments in the Contract Labor (Regulation and Abolition) Act 1970 may be done by the Government of India to permit private sector participation in this service.

4.7 Enforcement

A system of levy of administrative charges or special cleaning charges from those who litter the streets causing nuisance on the streets may be introduced and powers to punish offenders may be given to the local bodies through suitable additions to the Municipal acts and rules.

4.8 Management Information System

MIS is the key to monitoring the performance of manpower and machinery and to help in planning for the future. Detailed management information systems suggested in the report may be introduced.

4.9 Financial Aspects

The poor financial health of ULBs is a major constraint in improving SWM systems. The financial condition of local bodies may first be improved by setting the house in order and a series of measures toward financial discipline, avoidance of wasteful expenditure, prioritizing the expenditure on essential services, as recommended in the report may be taken. Taxes, user charges and fees should be raised and linked to the cost-of-living index. Area-based property tax reforms may be taken up to improve the finances of the ULBs.

4.10 Financial Support to ULBs by States and Central Governments

Financial support to ULBs from the State Government and the Central Government in terms of the 74th Amendment to the Constitution may be given expeditiously and funds may also be allocated to ULBs for a period of three years as per the formula given in the report. In the meantime, transfer of unspent grants by the 10th Finance Commission to the ULBs may be considered for modernizing their SWM practices. Fiscal autonomy to local bodies, tax free status for municipal bonds, incentives to recycling and composting industries may be considered by the Central and State Governments and Union Territories.

4.11 Health Aspects

Improper SWM practices give rise to problems of health and sanitation. Twenty two types of diseases are associated with improper SWM practices. Proper

management of processing and disposal sites, special attention to cleaning of slums, provision of low cost sanitation facilities to prevent open defecation, prevention of cattle nuisance, proper training to the workforce and use of protective clothing are some of the measures the local body should take immediately to protect the health of the citizens and the workforce.

4.12 Legal Aspects

Citizens' active participation may be ensured through massive public awareness campaigns. Simultaneously, adequate provisions may be made in Local State Laws governing the local bodies to ensure public participation and action against defaulters. Legislative provisions to be made by each State have been suggested in the report.

4.13 Public Awareness Strategy

Public awareness campaign using information, education and communication (I–E–C) techniques may be used. Waste Reduction, Reuse, Recycling (R-R-R) may be advocated to reduce the burden on the local body and citizens may be motivated to store waste at sources in a two-bin system, co-operative with the doorstep primary collection system and keep the city litter-free. Hygienic Solid Waste Management needs to find a place in the National Agenda.

5.0 RECOMMENDATIONS FOR SOLID WASTE MANAGEMENT

Given the vastness of the country and the present condition of urban local bodies, implementation of these recommendations requires a very effective follow-up, monitoring and technical support. A Technology Mission for SWM may, therefore, be urgently constituted by the Government of India under the Ministry of Urban Development for a period of 5 years, having a mandate to monitor performance of various local bodies, to guide the local bodies about various technologies for processing and disposal of waste, to give technical assistance as well as financial assistance by channeling funds from various Government sources as well as financial institutions to develop material for awareness programs, identify training needs, bench-mark performance indicators and give continued and focused attention to the reforms of SWM practice nation-wide.

5.1 Time Frame

A time frame is necessary to implement the recommendations, which have been prescribed ranging from 3 months to 3 years as per details given in the report.

5.2 Acceptance of the Report and Its Implementation

The report was submitted to the Supreme Court on 31st March 1999, which has been accepted by the highest Court of the country with a note of appreciation. The report has been widely circulated to all the states and 300 class-1 cities of India. The states and the city governments have been asked about the implementation of the report. Most of the responses received by the Supreme Court are positive. Based on this report, Honorable Supreme Court has directed the Ministry of Environment to issue notification under the Environment Protection Act for improving the solid waste management systems in the country. A draft notification to that effect is now issued and is at the stage of finalization, which will be binding to the whole nation.

The Honorable Supreme Court has also directed five mega cities, viz., Delhi, Mumbai, Calcutta, Chennai and Bangalore to start implementing the report and let the court know if there are any problems in implementation. The Central Pollution Control Board has directed to monitor the implementation. Further directions to 300 cities are likely to be issued in a short time. Meanwhile, most of the cities have already started implementation of the recommendations seriously. Lot of awareness has come in the city governments about managing the waste scientifically.

5.3 Drafting of Manual on Solid Waste Management

A national manual on solid waste management is also drafted by an expert committee having the author of this report as a common member in the Supreme Court Committee as well as in the committee for drafting the manual on solid waste management. The draft manual is already circulated to the whole nation and is discussed in great details for two full days at Delhi on 17th and 18th of February 2000 to give a final shape to the manual.

5.4 Formation of Technology Advisory Group on SWM

Based on the recommendations of the Supreme Court Committee, the government of India has constituted a technology advisory group on solid waste management to advise the country on appropriate technologies of waste management. The author of this paper is also appointed as a member on this group. The group is deliberating on various aspects of technology for processing and disposal of municipal solid waste and would be advising the city governments and the states in adopting

appropriate technologies to protect the health and environment through better solid waste management systems in the urban area.

5.5 NGO, Public and Private Sector Participation

The entire report of Supreme Court Committee and the manual for the solid waste management lay emphasize on active involvement of non-governmental organizations (NGOs) in creating awareness among the people, in organizing the ragpickers for collection of recyclable materials and in organizing doorstep collection from households, shops, and establishments.

A lot of emphasizes is given on public participation, without which no system would ever succeed. Public participation in the area of storage of waste at source, and at the community level and in the primary collection of waste is highly advocated and insisted upon. Legal provisions are also suggested to take action against the citizens if they fail to comply with in spite of repeated instructions through awareness campaign to co-operate in the system.

5.6 Private Sector Participation

Private sector participation is the key to success in the areas where higher technologies are involved and where personalized services are proposed to be given. With ever-increasing cost of manpower and relatively lower efficiencies of public sector undertakings, it has been strongly recommended that private sector should be involved in the area of doorstep collection of waste from hospitals, nursing homes, hotels, restaurants, commercial complexes, households, etc., as well as in the area of transportation of waste and setting up solid waste treatment and disposal facilities in the urban areas.

APPENDIX I

PROGRAM SCHEDULE

REGIONAL SEMINAR ON COMMUNITY BASED SOLID WASTE MANAGEMENT

Venue	:	BRAC Center, 75 Mohakhali Commercial Area, Dhaka - 1212, Bangladesh
Organized by	:	Waste Concern, Dhaka, Bangladesh with the support of Regional Urban Development Office (RUDO – South Asia, USAID), Urban Management Program (UNDP/UNCHS – Regional Office for Asia and the Pacific) and Water Sanitation Program (WSP – South Asia)

Program
Day 1: Saturday, 19th February 2000

9: 00 Hrs-10:00 Hrs	Registration
10: 00 Hrs- 11:00 Hrs	**Inauguration**
	Chairman : Secretary, Ministry of Environment and Forest, Govt. of Bangladesh
10:00 Hrs-10:05 Hrs	Recitation from the Holy Quran
10:05 Hrs- 10: 15 Hrs	Welcome Address by A. H. Md. Maqsood Sinha, General Secretary, Waste Concern

10:15 Hrs- 10: 30 Hrs	Key Note Address by Prof. A. T .M. Nurul Amin, Professor, Urban Environmental Management, AIT, Bangkok
10: 30 Hrs-10: 40 Hrs	Address by the Special Guest, Syed Marghub Murshed, Secretary, Ministry of Environment & Forest, Government of Bangladesh
10: 40 Hrs- 10: 50 Hrs	Address by the Chief Guest, Mr. H.N. Ashequr Rahman, Honorable State Minister for Environment & Forest, Government of Bangladesh
10:50 Hrs – 11:00Hrs	Vote of Thanks by Mr. James I. Stein, Director, RUDO, South Asia, USAID (on behalf of the sponsors)
11:00 Hrs- 11:30 Hrs	Tea/ Coffee
11:30 Hrs- 13:15 Hrs	**Technical Session– 1 Community Participation in Solid Waste Management and Prospects of Community Based Waste Recycling and Resource Recovery**
	Chairman : Dr. ATM Nurul Amin, Professor, Urban Environmental Management, Asian Institute of Technology, Bangkok, Thailand Presentation of 5 papers on session themes from participating countries followed by discussions.
13:15 Hrs- 14: 00 Hrs	Lunch
14:00 Hrs - 15:30 Hrs	**Session-2 Public-Private/GO-NGO Partnership for Solid Waste Management**
	Chairman : Mr. Han Heijnen, Environmental Health Advisor, WHO
	Presentation of 6 papers on session theme from participating countries followed by discussions.

15:30 Hrs-16:00 Hrs	Tea/Coffee
16:00 Hrs -17:00 Hrs	Session – 2 (continued) Presentation of 2 papers from participating countries followed by discussions

Day 2: Sunday, 20th February 2000

9: 30 Hrs-10:00 Hrs	Summary of Day-1 Presentation : Mr. Shaiful Azam Ahmed
10:00 Hrs-11:00 Hrs	**Session-3 Regional Issues on Community Based Solid Waste Management and Response from Governments** Chairman: Mr. James I. Stein ,Director, RUDO South Asia, USAID Presentation by Mrs. Almitra Patel, India Presentation by Mr. P U Asnani, UEIR,USAEP-USAID
11:00 Hrs-11:15 Hrs	Tea/Coffee
11:15 Hrs-13:30 Hrs	**Session-4 : Way Forward/ Strategies to Improve and Scale up Solid Waste Management in the Region** Chairman : : Mr. Han Heijnen, Environmental Health Advisor, WHO Facilitator: P U Asnani, Dr. Tanveer Ahsan, Mr. Han Heijnen, Ms. Clarissa Brocklehrst, Mrs. Almitra Patel and Mr. Christian Zurbrugg Group Discussion (Participants Divided in Three Groups)

13:30 Hrs- 14:30 Hrs	Lunch
14:30 Hrs-16: 00 Hrs	**Valedictory Session**
	Chairman : Prof. Nazrul Islam, Chairman DWASA Board
	Presentation of Recommendations/Strategies by Facilitators (Mr. P.U. Asnani, Mr. Christian Zurbrugg and Mr. Han Heijnen)
	Speech by Mr. Habibullah, Secretary, Dhaka City Corporation (DCC)
	Speech by Mr. James. I. Stein, Director, RUDO, South Asia, USAID
	Vote of thanks by Mr. Iftekhar Enayetullah, Assistant General Secretary Waste Concern
	Closing Remarks by the Chairman, Prof. Nazrul Islam, Chairman DWASA Board
16:00 Hrs – 16:30 Hrs	Tea/Coffee

APPENDIX II

List of Participants

A. INTERNATIONAL PARTICIPANTS

India

1. P. U. Asnani
   Urban Environmental Infrastructure
   Rep, USAEP-USAID
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6. R. P. Sisodia
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7. G. R. T. Omprakash
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8. Reva Sood
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LIST OF ACRONYMS AND ABBREVIATIONS

AIT	Asian Institute of Technology
BBS	Bangladesh Bureau of Statistics
BIT	Bangladesh Institute of Technology
BMA	Bangkok Metropolitan Authority
BTV	Bangladesh Television
CBO	Community Based Organization
CBOs	Community Based Organizations
CBSWM	Community Based Solid Waste Management
CPI	Center for Policy Implementation
DCC	Dhaka City Corporation
DoE	Department of Environment
DUDA	District Urban Development Authority
DWCUA	Development of Women and Children in Urban Areas
ESCAP	Economic and Social Commission for Asia and the Pacific
EWS	Economically Weaker Section
FORCE	Forum of Civic Exnoras
GoB	Government of Bangladesh
GOs	Government Organizations
HRMDC	Human Resource Management and Development Center
IEC	Information, Education and Communication
KCC	Khulna City Corporation
KDA	Khulna Development Agency
MCH	Municipal Corporation of Hyderabad
MIG	Middle Income Group
MJS	Muskan Jyoti Samiti

MoEF	Ministry of Environment and Forest
MSWM	Municipal Solid Waste Management
NEERI	National Environmental Engineering Research Institute
NGO	Non Government Organization
OPP	Orangi Pilot Project
POs	People's Organizations
PWD	Public Works Department
RDD	Regional Development Dialogue
RMC	Resource Mobilization Center
RT	Neighborhood Units
RUDO	Regional Urban Development Office
RWA	Resident's Welfare Association
SANDEC	Swiss Institute for Environmental Science
SDC	Swiss Agency for Development and Co-operation
SEMP	Sustainable Environmental Management Program
STEP	Students Exnora Program
SUDA	State Urban Development Authority
SWM	Solid Waste Management
TDH	Terres De Hommes
ULBs	Urban Local Bodies
UN	United Nations
UNCHS	United Nations Center for Human Settlements
UNDP	United Nations Development Program
UNICEF	United Nations International Children Emergency Fund
URC	Urban Resource Center
USAEP	United States Agency for Environmental Protection

USAID	United States Agency for International Development
VGDS	Voluntary Garbage Disposal Scheme
VSS	Voluntary Sweeping Scheme
WASA	Water and Sewerage Authority
WSP	Water and Sanitation Program
WW	Waste Wise

One Katha = 720 sq.ft

One Bigha = 20 Katha = 20 x 720 = 14,400 sq. ft.

Waste Concern established in 1995, is a non-governmental research based organization, working closely with international agencies, government, private sector and local communities to improve solid waste and environmental condition. This research-based organization involves the cooperative efforts of experts from different fields.

Waste Concern is active in the following fields:

- Solid Waste Management and Resource Recovery
- Clinical and Hazardous Waste Management
- Waste Water Treatment
- Community Based Environmental Improvement
- Urban Environmental Management
- Municipal Services Planning
- Environmental Impact Assessment
- Organic Farming

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